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A FULL and DISTINCT
ACCOUNT
OF THE
Mineral Waters

OF
PYRMONT, and SPA.

CONTAINING,

- I. The natural History of the adjacent Countries, and of the several medicinal Springs therein.
- II. A New Chymical Examination of the Waters, whereby their real Contents and Ingredients are clearly discovered.
- III. Of their various Virtues and Effects upon Human Bodies, and the Diseases that have hitherto been cured thereby.
- IV. The most approved Method of using them; as to the Season, and the Quantity, according to the Difference of Age, Sex and Constitution.
- V. Of Bathing with them.
- VI. Of the Abuses and Mistakes in using the Waters, whereby they may prove dangerous and hurtful.

Collected from the best AUTHORS,
And improved

By Dr. *T U R N E R*.

THE SECOND EDITION.

L O N D O N:

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(Price Two Shillings.)

ACCORD

OF THE

Ministry

OF

PARSONS

OF THE

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TO THE READER.



THE mineral waters of Pyrmont and Spa having for many years been greatly esteemed in most countries of Europe for their wonderful and surprising efficacy in perfectly curing various diseases incident to mankind, when all other remedies have prov'd ineffectual, and alleviating others, which are in their nature incurable ; and being at present in great use and reputation in this kingdom, I am persuaded that a more full and distinct account of their particular Qualities, and of the right method of using them, than has hitherto appeared in English, will be very acceptable to the publick ; this I was the more inclinable to undertake, having experienced the singular efficacy and vertue of the Chalibeat waters in a case of my own, from which, by their means, I was happily recover'd ; I therefore think myself particularly obliged to promote, to the utmost of my power, the knowledge of them, and likewise the method which able physicians have by long experience and observation found to be most safe, proper and necessary in using them ; and tho' it is not to be supposed that any unreasonable Man will have so little regard to his health, as rashly to enter upon a

To the READER.

course of Chalibeat waters without the advice and direction of a skilful physician, yet as most patients are liable to forget the rules and directions that are given them by word of mouth, and as they have not always a physician by them, it seems very necessary to put into their hands such an approved method as is to be strictly observed, that they may know how to govern themselves from the beginning to the end of the course; provided nothing extraordinary or unusual happens during the same; and I believe every one will think this the more expedient, that seriously considers that an irregular method of using the waters will not only frustrate all the hopes and expectations of the patient, and render his trouble and expence ineffectual, but what is worse, may heighten the distemper he already labours under, or bring on others equally or more insupportable, and as I had ocular demonstration, upon the spot, of the wonderful effects of those waters, I thought it necessary to spend some time both at Pyrmont and Spa, that by a careful examination of the ingredients of the waters, and of the grounds and foundation upon which the physicians of those places build their practice, I might acquire a tolerable knowledge of what I intended to recommend to the world. But on the other hand it must be own'd, that in treating of a subject of this nature with any perspicuity, it is not enough for a person to have sufficient abilities to make a philosophical enquiry into the several ingredients of the waters, but he must likewise have had opportunities by long experience and successful practice to observe and thoroughly understand their particular virtues, effects, and manner of operating; but as this is not the work of a few days, and a short stay at those places, but of long observation and repeated trials; I therefore thought it would be most acceptable to all persons of reason and judgment, if I made choice of some of the most celebrated and approved authors, who by their capacities
and

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and experience bid fairest to understand this subject, and to extract from their writings what would be most useful to the English reader, either unacquainted with their language, or not having opportunities to peruse them; and tho' the waters of Pyrmont are esteemed among the best, if not the richest of any cold Chalybeat waters in Europe, and the cures performed by them are as great and remarkable as of any waters whatsoever, yet they are not so generally known amongst us as is to be wish'd, there being no perfect account of them published in our Language; wherefore I had them chiefly in my view, and have made choice of that full and learned description of them given by the ingenious Dr. SEIPPIUS, first physician and counsellor to the prince of Waldeck, a gentleman of great learning, long experience, and fine taste, who has constantly resided and practised at these wells above twenty years, and with great industry and pains has acquired so thorough a knowledge of this subject, that he seems to have left little to the further enquiry of others, and is so courteous and obliging to strangers, that he readily communicates his knowledge to such as are capable of profiting thereby. As the learned author differs in many circumstances from others who have wrote on the same subject, I believe the curious will not think their labour lost in observing what he has said. I have extracted from his Book what I thought necessary both with respect to the natural history of the valley of Pyrmont, where the wells are, and also the chymical analysis of the waters themselves, in which he is very curious and full, and his method and rules to be observed both in drinking and bathing are so very reasonable, that I have omitted nothing material that may be useful to the patient. In his book, which is writ in the German language, things are handled at a great length, and there are several learned and curious digressions, which I have omitted,
proposing

To the R E A D E R.

proposing to myself to represent to the reader, as briefly as I could, only such things as seemed most for his purpose, and I hope I have done the learned author justice in representing his thoughts aright, without intermixing those of any other author; so that he alone is to be understood to be the person that speaks from the beginning to the end on this subject.

In the account of the waters of Spa I have made use of Nessel, Stephijs, Chrouet, Coquelet, Bresmal, d'Heers, Gerinx, &c. and as their Rules and directions in using these waters are much the same as those of Dr. Seippius, I thought it needless to mention them, but refer the reader to the method to be observed in the use of those of Pyrmont, and so avoid a great many unnecessary repetitions, which would swell this treatise to an unreasonable bulk.

The good effect of the waters depending not only upon their being genuine, but in good condition, such as are adulterated and ill-managed being very pernicious to the patient, I took a particular care last summer when I was at Pyrmont and Spa to settle a correspondence with proper agents, whose fidelity I can safely rely on, that a sufficient quantity of the waters of both places be from time to time and at proper seasons bottled, sealed, pack'd up, and sent over, in such a manner, as they may lose as little of their virtue by the carriage as possible; I can therefore assure all persons that shall have occasion, that they may be furnished therewith to their intire satisfaction, at the Mineral Water Warehouse in St. Albans Street, near Pall-Mall; where is likewise to be had the choicest of all other mineral waters now in use.



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CHAP. I.

A Physical Description of the Valley of Pyrmont, of the Chalibeat, and other Springs, that are to be seen therein.



THE county of *Pyrmont*, belonging to the illustrious *Prince of Waldeck*, famous for its medicinal waters, which have been well known in most Parts of *Europe* above 200 years, lies, in the opinion of the best geographers, in the 52d degree of latitude, and 29th of longitude; tho' in most new maps it is placed in the 53d degree of latitude, and 30th of longitude; towards the north and east it borders upon the elector of *Hanover's* dominions; towards the south and west, partly on the elector of *Hanover* and duke of *Wolfenbuttle's* territories, and partly on the county of *Lippe* and bishoprick of *Paderborn*.

The lower part of the county, particularly the valley where the castle of *Pyrmont* stands, and the *Chalibeat* waters are, is a most agreeable country, yields a very fine prospect, and is much admired by all strangers; and whereas most mineral waters come from under high hills, deriving their medicinal qualities from the minerals contained

in their bowels, the wells, generally speaking, are so shut up by the mountains, that there is either no prospect at all, or it is very inconsiderable; on the contrary, in this valley of *Pyrmont* there is a plain of three *English* miles both in length and breadth, thro' which runs the river *Emmer*, upon whose banks are the most beautiful meadows and pastures that can be seen any where, and from thence to the Mountains are excellent corn-fields, and this beautiful and fruitful valley is surrounded with a circle of high green hills.

The wells lie between the castle of *Pyrmont* and the town of *Oestorff*, and have for many ages been very much admir'd for their particular taste and wonderful properties, as might be easy to shew from many authentick histories; they were anciently called the *Holy Wells*, (*Heiligen Brunnen*) and the ground where they spring up was called the *Holy Meadows*, and at present they are frequently so called by the inhabitants, probably, because they were look'd upon as a sacred wonder of nature upon the account of the unusual manner of their rising and bubbling out of the ground, and of their particular taste and healing qualities, which many ancient authors have taken particular notice of.

The better to understand the nature of these mineral waters, it is necessary to inquire a little into the nature and qualities of the country and ground from whence they spring, and as we have already told you that the valley of *Pyrmont* is surrounded with hills, we shall first consider those towards the north, for, from under these the waters come, and without doubt bring along with them some parts of the mineral contents.

The uppermost part of these hills is, a very good fruitful soil, very proper for all kind of corn and garden herbs. The next *stratum* is yellow or whitish *clay, marle, sand, &c.* sometimes one, sometimes th'other, and under these is found, in divers places in great abundance, a *brown reddish stone*, sometimes in great lumps, and sometimes in small pieces; and about 800 paces from the wells towards the east is a *stone quarry*, out of which they dig yearly a great quantity of stones for building: These stones are easily splinted as they lie horizontally, and in many of the splinters are to be seen many small particles like filings of silver, and in the small vacuities between the splinters is found a *glutinous reddish earth*, very like the *Terra Lemnia*.

The quarry men dig always into the mountain horizontally, for if they should dig downward they would soon meet with a *sulphureous suffocating exhalation*, as they did a few years ago, when at my desire they went deeper, and altho' the Hole was very small, and not very deep, yet they felt it for several days after, by which we see that without any great trouble, there might be a *Grotto del Cane* made, like to that between *Naples* and *Puzzolo*; for not many years ago, during the greatest heat of the summer, especially in the month of *August*, the exhalation was so very strong, that when the sun shone directly into the foresaid hole, the motion and rising of the vapour was very visible, and every day were found near to it dead fowls of different sorts, which having come to feed upon the insects that were killed by the exhalation, were themselves catch'd in the same manner.

At the same time the experiment was made with a dog, which being tied with a rope, and

thrown upon the hole, he presently began to breathe very hard, to leap, open his mouth and pant after fresh air, he would have instantly fallen down dead, if he had not by leaping gone out of the horizontal line, where the vapour was more rarify'd, and so catch'd some fresh air. This vapour, just like that of the *Grotto del Cane* near *Puzzolo*, seldom rises higher than one foot and a half, or two foot above the ground, so that one may safely enough stand in it, providing he don't stoop too low.

Towards the north, about 500 Paces from the wells, lies a great, high and long hill called *Bomberg*, in whose bowels, or perhaps in the bowels of the contiguous hills, so far as we can conjecture, is gather'd together the water that supplies our wells, which afterwards sinks and penetrates thro' the hills till such time as it can find a convenient out-gate; but what kind of minerals are contained in these hills has not hitherto been fully inquired into; but not far from the steel well (commonly called *Stabl Brunnen*) on the same side is a rising ground full of very porous stones like to the *Tophus*, which being broken, appear like iron rust or dross, some red, and some brown, and black, which being thrown into a furnace, and afterwards separating the lighter particles or dross from the more weighty, we found by a loadstone, that a great many particles of iron were contained in the same; so that we may conclude, that if the uppermost stones give such indications of iron, if we should dig deeper, we might find great plenty both of *irony* and *sulphureous stones*.

Not far from this stony rising ground, and about a musket shot from the *Stabl Brunnen* (steel wells) are the *Stein Quellen* (stony springs) whose waters,

waters, spreading themselves over the contiguous ground, wherever they come, they cover every thing with a *stony crust*, which is not easily separated from any thing it cleaves to. If you take a handful of the black mud from the bottom of these Springs, it smells like the *hepar sulphuris*, or like a gun newly discharged; and the stones, after they are burnt and thrown into water, smell after the same manner. From hence we may conclude, that very probably the water derives from the subterraneous sulphur, a property and virtue to dissolve and incorporate into it self the stony substance, which, when it comes into the open air, it throws off and lets fall again.

As to the wells and water which are found round the *Steel Wells*, and which descend from some hills and rising grounds which lie north and east, it is to be observed, that all of them have something of the acid, mineral, sulphureous spirit, which is not common to water that comes from other places, and which is very discernable to the taste of those that are not used to such waters.

About two hundred paces from the *Stone Quarry*, there is a very strong spring of acid water, very pleasant to the taste, which has indeed a great deal of the *acid mineral spirit*, but brings along with itself nothing of *iron*, or any other *mineral substance*, except a little *bitterish salt*, and a little *subtilized earth*; we call it by the name of *Berg Sauerling*, because it springs up on a hill, where the ground is very stony, and it's source is much higher than that of any other of our acid springs. It mixes exceeding well with wine, pearles prettily, and has a most agreeable taste, and would be very proper for them that like to drink water

with their wine at meals, but find the *Stahl Brunnen* water too strong for them.

The waters that are to the north west are commonly heavier and more acid than those towards the east, perhaps because they run deeper under ground, and so have passed through more of the mineral. There are many other small springs here and there, which have an *acid taste*, contain a *yellowish irony earth*, and have something of the contents of the *Steel Waters*, but in much smaller quantity.

The waters that come from the north west are heavier and more acid than those from the east: And on the other side in the meadows, there are a great many small springs of the same quality, but are not so strong of the mineral, neither do they throw up so much water.

All these different springs are so many indications and proofs, that all round under ground, is full of irony and sulphureous stones.

There is one thing to be observed with respect to the waters that rise near the head-wells; a few paces behind the well-house, several small springs run together into a canal, by which they are carried into the common bathing-place. In the year 1716, I found in this ditch, all at once, here and there, three pound weight of the cleanest and most beautiful *lapis selenites* that ever was seen, some pieces of it weighing twelve ounces, which had been formed in this water. These springs are not very *acid*, neither do they give any yellowish tincture to the ground; and when it is evaporated, there remains behind a very *small saline earthy sediment*. This natural generation of the *lapis selenites* shews us, that there is a *crystal-line matter or substance*, which by art may be separated from our waters.

We come now to the *steel wells* (*Stabl Brunnen*) themselves, which in comparifon of the high grounds which lie to the north, may be faid to fpring out of a low ground, but with refpect to the plains that lie towards the fouth, and upon the river *Emmer*, they may be faid to lie high enough, for from the wells to the lower end of the avenue, it is above five hundred paces, and all along a very confiderable defcent, for which reason, waters of a different nature cannot fink towards thefe wells.

The head well, which formerly was called the *Holy Well*, is inclofed and covered with a large eighth cornered houfe, by which it is preferved from all dirt, and from the mixture of rain or other water.

The place where the fpring rifes is about four foot and a half diameter, and the water ftands about three foot and a half above the fpring (or is three foot and a half deep), becaufe the conduit or canal that carries it away cannot be made lower; and the weight of the great quantity of water that ftands upon the fpring, is the reason why this well does not fpring or fpout up with fo great force, nor fo high as the *Brodel Burn*, only the fprings throw up fmall bubbles like water that begins to boil; but the fpring is very ftrong, and pours forth a great quantity of water, fo that there is never any want, how much foever you pleafe to carry away, and I have in one minute taken up from the ftream that runs from the well, four large buckets full, containing thirty pound weight of water each, which amounts to a vaft quantity in twenty-four hours.

About forty-two foot from this well fprings up the great *Brodel Brunn*, which has hitherto been made ufe of only for bathing, it being neither fo

spirituous, fine, nor clear as the well used for drinking. This is found by experience not to be so good for drinking as the other, and does not pass so easily.

This great bathing-well is fourteen foot in circumference, the water stands two foot above the spring, (or is two foot deep;) and in this place there are between thirty and forty great or small boiling springs, that rise out of the ground with great force, and make a greater noise than a brewer's copper when boiling, so that in calm weather it is easily heard at the distance of fifty paces. About a hundred and twelve foot west of the well used for drinking, there is another well surrounded with oaken pales, about twenty two Foot in length, and sixteen broad, the water is about four foot deep, there are several springs both great and small in it. This well is weaker than any of the other, and has very little of the acid mineral spirit in it, and is commonly used by poor people for a cold bath.

These waters bring along with them in great quantity a reddish yellow earth, which may be gathered in great abundance, both in the wells, and in all the conduits and ditches through which they run, for six hundred paces from the springs, and the avenue and all the ground on both sides is full of it, which in some places lies two foot deep, clean and without any mixture: *This yellowish earth*, being either taken from the springs or the water conduits, or the ground about the avenue, when smelted, will answer the loadstone, and when it is separated from the *alkaline earth*, and *crystalline cremor* (as we shall afterwards show,) has all the properties that perfect iron or steel has. Although this ferruginous earth, as we may call it, is found in great plenty wherever the water runs,

runs, yet there is not to be found the least piece of *tophus-stone*; and this is so much the more remarkable, because the stony springs (*Stein Quellen*) are so near; so that it is evident they have no communication under ground with the steel wells.

This ferruginous earth is not only found in great plenty about the wells, but also sticks to all vessels wherein the water is kept either hot or cold, and dyes them yellow: notwithstanding of this, the *iron* constitutes the smallest part of the *solid substance*, or *hard matter*, which is incorporated with the water.

So far as I have been able hitherto to find out by repeated experiments, a pound of water contains only two grains, or two grains and a half of iron, after it has been cleansed from the *crystal-line* and *alkaline cremor*, and smelted into a pure and clean steel; but the whole *sediment*, or all that hard and dry matter which remains, after evaporating the fresh water, weighs twenty two grains, so that the *steel* makes at most but one eleventh part of the ingredients. As we are now speaking of the *materia* which the mineral waters bring along with them, it must be remembered, that our waters never suffer any alteration either from dry or wet weather; and whereas it is a common complaint, that in many mineral springs, in rainy weather, they become much weaker, and when they are evaporated don't leave behind half the matter as in dry weather; on the contrary, our waters in all seasons of the year, and in all kind of weather, wet or dry, yield always the same quantity of matter or sediment.

We may make this further observation upon what presents it self to our outward senses when we drink the waters at the wells, *viz.* as soon as you take up a glass full of it, you perceive an
infinite

infinite number of small pearles or bubbles rising in the glafs, and which are in greater number when the glafs is thrust with violence into the well, and the air is thereby forced into the glafs under the water, for then they rise with a noise, and like a vapour above the edge of the glafs, so that if you hold the glafs over against you, your face will be sprinkled with the particles of the water.

It is commonly believed by water-drinkers, that these rising pearles and bubbles are the *spirituous* or *subtilest* parts of the water, and contain all the *Virtue* of it, so that they swallow it down with great haste, that they may not lose the virtue of it; but if you take up the water out of the well softly, and not thrust the glafs into it with violence, then there is little motion to be seen in the water, and yet there is the same quantity of Spirits in it; so that it is the *air* that occasions this commotion in the water, and all these pearles and bubbles are so many particles of air, which being shut up in the glafs extricate themselves out of the water, and so occasion that commotion, but the *spirituousness* of this water is the reason why the air mixes more easily and plentifully with it than with other water.

The water is clear as chrystal, only you may observe some small appearance of a milk colour in it, which distinguishes it from common water; when the water is first taken up, this appears but very little, but shows it self more and more every hour, when it is put into an open glafs and exposed to the open air, and so much the faster the warmer the place is. This *milk colour* afterwards changes into *reddish*, *troubled*, or *muddy clouds*, wherewith the *steel* separates it self, and shows it self above like a *shining glittering skin*.

The

The taste of the fresh water is *acid* like wine, pungent, sharp, refreshing and pleasant, but at last tastes somewhat of vitriol, so that many wish they could exchange the last taste with the first; nevertheless most drinkers of these waters drink them with very good liking, and frequently drink more of them than they are ordered, or is necessary for their cure.

By the smell one may discover in our wells a *subtile sulphureous* vapour, which sometimes makes the water-servers giddy and light-headed, and this is most observable when the greatest quantity of water is drawn off. This *sulphureous* vapour is the cause why fish and frogs, ducks and goslings, when thrown into these wells, grow giddy and lose their strength, and at last fall down and sink, though this does not presently happen, but ducks, for example, swim sometimes an hour before they are any way affected; and if these animals, as soon as they begin to sink, are taken out, they neither suffer in their health nor life, and soon appear as brisk as ever.

This *sulphureous* vapour is not always alike strong, but is strongest in the hottest season, so that when the heat is exceeding great, young ducks will fall down dead in a moment, though old ones will hold it out longer. But this vapour has not the property of a *poison*, which when it gets into the body abides therein, and corrodes the same, but it has only a particular *elastick, dilating power or quality*, by which often in a moment, as soon as a sufficient quantity of it falls into the lungs, it drives and keeps out of them all air whatsoever, and so puts to a stand all the organs of respiration, and at once makes all motion in the breast to cease; but as soon as the vapour shut up in the breast finds a free egress, and the fresh
air

air enters, the animal comes to it self again, and suffers no hurt; so that creatures die for want of fresh air, not through the influence of any *arsenical matter* conveyed into the body by the vapour: and as I told you before, this vapour does not rise much higher than a foot above ground, so that old geese can by reason of the length of their necks, continue much longer in the water.

This acid *sulphureous spirit* is the reason why the waters never freeze, no not in the coldest winters, as in the years 1709 and 1716.

To conclude this physical description of these mineral wells, I shall say one word relating to the daily use of them.

Many inhabitants of the county of *Pyrmont*, and of other places that lie next to it, particularly the inhabitants of *Oestorf* make use of this water the whole year, summer and winter, whenever they are thirsty and at their meals, as their ordinary drink, and at dinner-time they come with their flaggons and bottles as if it were an alehouse: every body makes use of this water, young and old, and many sick and confined to their beds, women in child-bed, and sucking children, they are not afraid of its pungency or sharpness, or that it should affect their lungs, or do them any hurt; but from long experience they know, that commonly it is good for every body, keeps the stomach in good order, and sharpens the appetite: and in this county the people are strong and healthy, and arrive at a great age; for in the lower part of the county, during the last thirty years, it is computed, that about 1500 men have died, among whom were 128 that were sixty years old; 109 seventy years; 57 eighty; 37 ninety; and 6 one hundred years old and above; which altogether amount to 339 old people, which is almost
a fourth

a fourth part of the whole number, and in some places the old men bear a greater proportion.

CHAP. II.

A chymical examination and inquiry into the nature of the Pyrmont waters, whereby their real contents and ingredients are clearly discovered.

FROM what has been said in the preceding chapter, all circumstances duly considered, it will be easy to find how far one may venture in passing a judgment, with respect to the contents of these waters, and without stopping to examine and confute what several learned physicians have advanced, I shall proceed to show what I have found out by frequent examination and daily experience; and so far as I can demonstrate my *thesis*, it will at the same time appear how far some have been mistaken, and how many things others have with the greatest assurance asserted, without having made the least examination and inquiry into the nature of the water. We shall therefore first show, that the *spirit* which preserves the whole mixture, and all the chief properties of the water, is a *subtile, acid, sulphureous spirit*.

2dly, That this spirit is herein intirely different from the common spirit of sulphur; that it brings along with itself a subtilized mineral-fat (*Pinguedo*) wherewith it was mixed under ground.

3dly, That this *spirit*, contrary to the opinion of all authors, does not *dissipate* and is not *volatile*, but on the contrary, the longer it is in the water, the more *fixed* it is. Particularly, 4thly, This spirit does by little and little unite itself with the
alkaline

alkaline salt, or with the subtile sweet *alkaline earth*, which is found in all mineral waters, and so makes of it a *sal enixum* or *neutrum*, like a *tartarus vitriolatus*, *sal polychrestum*, or very like *sal mirabile glauveri*.

5thly, That through this uniting of the *acid spirit* with the *alkali*, it must let fall all the *dissolved Iron* that it had assumed, and so the water must lose all *vitriol qualities*.

6thly, That the subtile sweet *alkaline earth* in the water does far exceed the *acid spirit* in quantity, so that consequently this *steel water* must operate more as an *alkali* than an *acid*.

7thly, That over and above all these forementioned *ingredients*, there is in the water a *clean, transparent, chrystalline, tasteless substance*, like the *lapis selenites*, or mountain chrystal dissolved.

In order to demonstrate these propositions clearly, we will first briefly enumerate the changes and separations which these ingredients in the water undergo in open *air* and in *distillation*, without any mixture of any other thing. And lastly, give an account of what remains, after the water is intirely evaporated.

The first change we observe in the water when exposed to the open air, and standing in a ditch or marsh, is the *party-colour'd shining skin*, with bright rainbow colours, which swims and covers the surface.

This *skin* of *divers colours* shows itself after the water has stood some hours in the sun, or has been warmed over a fire, and the more gently it is warmed, the more do these colours show themselves.

The next *ingredient* which separates from the water, is the *yellow ferruginous earth*, which shows itself very remarkably, not only in the open and
warm

warm air, but in all glasses, earthen, and other vessels whatsoever, into which the water is put, though ever so well corked and stoppt.

The more the water is warmed, either by the sun beams, or over a fire, or when a bottle full of it is put into a vessel full of hot boiling water, the greater motion appears in it, so that innumerable air-bubbles rise with great noise in the bottle, and break through the superficies of the water, and every little globule of air seems to carry along with it a small particle to add to the blewish skin, which by little and little increases and grows thicker; and this motion lasts a considerable while, about two hours in a moderate heat, so that it is scalding hot before its first *mixture* is thoroughly broken, and for a good while the water tastes strong of iron.

Lastly, When all the motion of the air-bubbles is over, the whole water appears yellowish and troubled, and the skin thick upon it, it becomes insipid and tasteless, so that one cannot find any more in it, the least appearance of its former properties. If you let the ferruginous earth settle well for some days, and then strain the water through paper, it will then be clear as crystal, and in a close glass will continue clear.

Let our water be poured into a glass receiver, or *still*, put a helm upon it, and begin to distil it into a close glass bottle, the same alterations appear in the receiver as in the open air and heat: but the beautiful Colours, which some pretend to have discovered in the helm during the distillation, are nothing more than what is usual in distilling common water, when through the refraction of the light, different colours, like the rain-bow, are formed in the receiver, and in the drops which fall from the helm.

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The distilled water, neither the first nor the last, has no acid or sulphureous taste or smell, nor has it ever any smell, if it be kept clean from dirt; but it tastes a little, as if something had been burnt in the receiver, if it be distilled with the gentlest heat, and *ex balneo mariæ*: but this burnt taste is soon gone, if the glass bottle wherein the water was preserved is not shut very close: If you decant it twice, there remains a very small portion of *white earth*, which mixed with acid things causes no effervescence. If you take a great quantity of fresh water, and put it into a receiver with a small hole above, and heat it as fast as possible, and then hold your nose over it, it has no other smell than the steam of common hot water. If with a gentle heat you evaporate one half of the water, and then set it in a cool place for twenty four hours, you will observe a great many small and somewhat long transparent crystals formed in it, which have no taste, and will not cause any effervescence, when mixed with acid things.

If you entirely evaporate the water, till it is quite dried up, there will remain a *brown, yellowish, red matter*, intermixed with some white; from a pound of water out of the *Trinck Brunn*, you have twenty two grain weight; from the greatest *Brodel Brunn*, twenty four grain; from the lower bathing-well, fifteen grain; and from the *Berg Sauerling*, five or six grain. If upon this *sediment*, or remaining *dry matter*, you pour a little distilled clean water, warm it a little, and then strain it through a paper, afterwards let it evaporate, till quite dried up, you will find a small white bitter salt; from the *Trinck Brunn*, seven grain out of a pound of water; from the *Brodel Brunn*, seven or eight grain; from the lower bathing-

bathing-well, five or six grains; from the well call'd *Berg Sauerling*, two grains. The remainder of the sediment which could not be dissolved in the water, is the *alkaline sweet earth*, the reddish *ferruginous earth*, and the *christalline substance*.

When the well known *Hydrometrum Kircheri*, or *Glass-water-Ballance*, is put into the fresh water, it sinks to the lowermost degree, but as soon as the water begins to be troubled, and to lose its acid taste, the *staticum vitreum* sinks to the second degree, and in the common sweet water of the country, it goes down to the third degree.

As it is well known that other *subtile spirituous steel waters*, when weighed presently at the spring, are, notwithstanding their mineral contents, lighter than common water, even than rain, or distill'd water; wherefore I took a glass-vial with a long narrow neck, and put five pound of our common sweet water into it, and marked with a diamond how high the water reached in the neck of the vial, and after pouring it out, I weighed five pound out of our mineral *Trinck Brunn*, and pouring it into the vial, it came so near to that of the common water, that it wanted only two thirds of a dram to make it come up to it: but afterwards having sometimes repeated this experiment, I found it did not always hold, and that according as the air is lighter or heavier, the water assumes more or less of it; but I design to examine this matter more narrowly at another opportunity.

These are the chief circumstances and alterations of the water, also the separations of its ingredients, which are brought about partly by itself, and partly by evaporating it by the heat of the sun, or by distillation; we shall enquire into the true causes of these several phænomena, and further explain them by several natural experiments,

ments, and so apply them where it is proper to our positions.

The first thing we have undertaken to prove is, that the spirit in the mineral water, which preserves and contains all its chief properties, is a *subtile, acid, sulphureous spirit*.

This position will meet with least opposition, seeing most physicians are of opinion, that the *spirituousness* in all mineral waters, particularly in those that are acid, proceeds from the sulphur of iron stones.

But seeing several of the moderns upon observing, that the *alkali* predominates in mineral waters, and not being able to find whence the *acid* should proceed, seeing no *vitriol* can be prepared out of such waters, do think that there is no acid in them, but that the *spirit* is rather of an *alkaline nature*, a gas *sulphureum ex marte*, without acid, like the vapour which rises when one pours *spiritum sulphuris per campanam*, or oil of *vitriol*, upon filings of iron. We will therefore mention some experiments, which will at least shew, that in our steel waters, there is an acid of sulphur, though the *alkaline matter* has the advantage, as in other wells: and first, it is allowed by both learned and unlearned, that the taste of the steel water is *acid*, and every body that knows what *acid* is, will reckon it among *acid* things: but it is not a corrosive, but a fixed acid, which leaves upon the tongue a pleasant, rough, sharp taste, like that of wine, beer, or other liquors, which have been rightly and duly fermented; and it is from this that such waters are called *acidulae*, though some have pretended to have found a sharp *alkaline* taste in the waters; but it is very evident, those gentlemen have conformed their senses to their pre-conceived opinion.

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Moreover, 2dly, The taste and the gentle metallick smell of the waters is so manifestly like that of *vitriol*, that even children themselves compare it to that of ink: now seeing there is no *vitriol*, nor taste of *vitriol* without *acid*, 'tis manifest that the mineral spirit of the waters is of an *acid* nature. Let us dissolve a little *vitriol* of iron in a good quantity of common water, and add to it some drops of the *volatile spirit of sulphur* or *vitriol*, it will smell and taste so exactly like the water of our wells, that one must do the greatest violence to his senses, to deny that they are like the one to the other; or if into a good quantity of common water, you drop *solutionem ferri per spiritum sulphuris vel vitrioli*, adding a little of the said spirits and of *glauber salt*, this mixture will taste more like the mineral waters.

3dly, We have already shewn, that in a stone quarry near the wells, and in the mineral wells themselves, there is a *sulphureous acid vapour*, which is frequently so strong, that all kind of beasts are killed thereby; when we examine the vapour in the hole of the quarry by the smell, we find that there is nothing it is more like to than to the *volatile, penetrating, acid smell* of great *black ants*, from whence they distil *spiritum formicarum acido volatilem*.

And seeing this vapour, as we have already shewn, vents itself through the mineral wells, consequently the waters cannot but be *acid*, for we know by many chymical experiments, how easily a mineral *acid spirit*, resolved into smoke, will fix itself in water placed near to it, and continue united with it.

4thly, It is only the *acid spirit* that can dissolve the ingredients contained in the water, and keep them in the form of a clear liquor; we have al-

ready shewn how easily the mixture of the mineral water is undone, and the several ingredients in it are separated; but if you mix a few drops of the *acid* of salt-peter or salt with it, but particularly the *spirit of sulphur* or *vitriol*, so that the *acid* begins to predominate a little, all the ingredients will remain dissolved, and the water continue clear as chrystal, whether hot or cold, so that they cannot be separated till all the water be evaporated.

If you take some very troubled mineral water, and drop a little spirit of *vitriol* into it, in a moment all the *ferruginous* earth, and whatever else is contained in the water, will dissolve, and it will become perfectly clear again; from hence we may clearly enough conclude, that the *menstruum*, or whatever it is, that sharpens the water, and communicates to it the dissolving quality, must be the *acid of irony and other mineral stones*.

5thly, Nobody has hitherto been able to prove, that any other beside an *acid spirit* arises, or can be prepared from minerals, and brought in *liquorem*, and seeing that subtil, rough, sharp, somewhat in the water, must be a *spirit*, & *quidem ex mineralibus*, necessarily it must be somewhat *acid*; and every where in all minerals and metals, the *acid* is to be found in and with the *sulphur*, and in many places great mountains, and large tracts of ground are full of them; and in great earthquakes and mines in several places of *Europe*, iron and sulphur are found together in stones or flints of different sorts.

And it has been demonstrated by the best writers on mineral waters, *E. G. Dr. Lister de fontibus medicatis Angliæ*, and *Dr. Bergern* in his dissertation *de Thermis Carolinis*, that the true original of all the ingredients and materials of *mineral acid*
waters,

waters, and of hot baths, is to be found in pyrites stones, moistened and mollified by water; and this truth is agreed to by the most learned philosophers in that way, and it also confirms this, that the spirit of the mineral water proceeds from the *acid*, seeing the irony stones and pyrites have no other thing else that is *spirituous* in them, and they consist of *sulphur*, *iron*, and a stony matter.

The *acid* of this sulphur is the only *menstruum* or instrument of dissolution, whereby all the *ingredients* of the irony-stones are made soluble, and united with the water. The *acid* alone without any *alkali*, together with the iron, gives the *vitriol* taste and *purple blue tincture* to the waters.

The *acid* also preserves in all *mineral*, especially *steel waters*, their excellent qualities and virtues, and to this they owe their good effects.

If once this acid be lost, or absorbed by the *alkaline terrestrial particles* of the irony stones or pyrites, the excellent mineral spirit, the *vitriol taste*, the *tincture*, as also the best qualities and virtues of the waters are lost at the same time. Wherefore the *acid* of the irony stones and pyritæ is the first and chief thing that ought to be considered in the original and mixture of the mineral waters, and if this be forgot, and only regard had to the *alkali* and the *salia enixa*, the key will be intirely lost; whereby the *generation*, and all the *phenomena* of *mineral waters*, may be clearly explained.

6thly, We have a very good proof *a posteriori* in our mineral waters, that there is not only an *acid* among its ingredients, but that it must be in specie, the *acid* of sulphur; for it is shewn under the fourth head or position, that the salt of the water consists of an *alkali*, and the *acid* of sul-

phur ; and that by adding *aliquod pingue*, it may be made *sulphur*, and out of the *sulphur* may be made *spiritus acidus*, or by adding of iron, *vitriol* may be made of it, also of the bare salt of the water a quantity of *pure sulphur* may be made ; and whosoever will rightly consider the original of this salt, as it shall be afterwards explained, as also the *generation* of the *sulphur*, and the experiments relating thereto, will, as it is hoped, have no further doubt that the *volatile spirit* of the water must proceed from the *acid* of *sulphur* in the irony stones and pyritæ.

Dr. Hare has indeed on the contrary asserted, 1st, That *sulphur* is an *alkali*. 2dly, That the *acid spirit* that is distilled from the salt of the *Pyrmont* waters, is only a *creature* or *productum* of the fire ; but seeing the author does not confute the experiments, whereby out of this *acid creature* of the fire, *sulphur* may be again made in different ways, and so become what it was, before ever it was brought to the fire, all his objections fall to the ground.

2dly, We see moreover, that this spirit is especially herein distinguished from the *common spirit* of *sulphur*, in that it brings along with itself a *subtilized mineral pinguedo*, a fat wherewith it was mixed under ground.

It is allowed, that there are few mineral waters to be found wherein one can meet with a right, pure, formal *sulphur*, except in those that are cold ; and various authors assert many things upon this head without any good foundation.

The principles of common *sulphur* are, an *acid*, a *small quantity of fat*, and of *earth*, and it is evidently, a *compositum*, which cannot be dissolved intirely in water without the addition of a *sharp alkaline salt*. When this is done either by art, or nature
in

in baths and wells, the waters have a strong rotten taste, and in many hot baths, may be compared to that of rotten Eggs, and such waters make silver first yellowish, and at last black, as *solutio sulphuris per alcali* uses to do ; but it is not so with our waters, wherefore we do not assert, that there is a *formal sulphur* in them, but it may well be put together or reduced from the *contenta* of the water, as we shall afterwards shew ; but that there is contained in it a *fat* and a *combustible substance* is manifest, for if you throw the *dried reddish sediment* of the water upon melted *salt-peter*, you will plainly see, that a great many particles of it do kindle and burn with the salt-peter, and this is more manifest if you gather a good quantity of the *skin of divers colours*, that is formed upon the waters, and after drying it throw it upon the smelted salt-peter, you will observe a great many clear sparks burning out of it, which you cannot observe, if you throw any matter upon it that has nothing combustible in it.

If you smelt a quantity of the yellow *ferruginous earth* which the waters leave upon the ground, in a close crucible, without mixing any thing with it, after it is bruised, it will follow the magnet, which throughly burnt iron crocus, in which there is nothing combustible left, will not do ; and before the magnet can move it, you must put some fat or combustible thing to it, and smelt it with it. And as the distilled water has something of a burnt taste, we may from that conjecture, that some combustible thing must be there, for such a taste proceeds only from fat and combustible things. Moreover, as fat things are light and swim upon the water, and appear in different colours, so also the skin of *divers colours*, which we have already described, is a manifest proof, that

the waters contain a *fat*; the *sulphur* also which by distillation is found in the salt of the mineral waters, is a proof of a *fat* in the waters, seeing there is no sulphur without it.

It is this *fat* which, together with the particles of iron, forms the skin of divers colours, and the said iron particles are kept swimming by it, for they being heavier than any of the other ingredients in the water, would necessarily fall to the bottom, if they were not supported by something that is light. It is this *subtilized fat*, bound up with the *acid spirit*, which gives the waters their *agreeable* and *spirituous taste*, and is the cause why they don't taste like common water, made sharp with the spirit of *sulphur* and *vitriol*, nor so flat and sweet as diluted *solutio vitrioli martis*, but rather *penetrating* and *piquant* like wine.

And the mineral waters may in several things be compared to *fermented liquors*, for as from a thick, sweet, and clammy *mustum*, by the internal motion and subtilization of the fat, and of the saline *acid* particles, a *spirituous, strong, clear and agreeable liquor* is prepared: in like manner from the coarse dead stones, by the constant moistening of the water, and motion of their particles, the excellent mineral *spirit* of the *medicinal waters* is formed in the bowels of the earth of *fat and acid ingredients*.

And as fermented liquors emit a sulphureous penetrating vapour, so that in great cellars, candles are frequently put out, and people made giddy thereby, so there arises a *vapour* from the mineral resolution of the stones, which at wells, and other holes and openings of the earth, getting vent, does affect both men and beasts.

We come now to the third position, *viz.* that the *said spirit*, contrary to the opinion of all authors,

thors, does not dissipate and fly away, but on the contrary, is always more and more fixed; and this is clear from the smell of the waters, when newly taken out of the well; for it is not penetrating, sulphureous and suffocating, as all *volatile spirits* use to be, but it is a vitriol smell, though sometimes it has something of a gentle *sulphur*, as when you dissolve vitriol of iron in water, and smell to it; in a word, it is a *gentle metallick*, and somewhat of a *sulphur smell*, as one may say of a piece of tin, copper, iron, silver, yea gold itself, that it has something of a smell, the effluvia being exceeding small.

If you set a great quantity of it upon the fire, which presently makes all *spirituous* things, which are any way *loose* and *volatile*, presently to smell strong, you may hold your head over it a great while, supposing a large copper full of it, and the fire be ever so strong, yet neither the organs of smelling nor of respiration shall be affected thereby; or if you have any objection to this, then hold your head over the small opening of a great glass receiver full of the water, and heated as quickly as possible, yet you will perceive nothing different from the steam of common water. Is this spirit then so subtile, that it cannot affect the organs of smelling and respiration? All the spirits we know, in the whole *materia medica* and *chymica*, the more subtile and volatile they are, the more powerfully do they affect the olfactory nerves; or how can we taste this spirit, but not smell it?

It is objected, that there arises a *sulphureous* vapour out of the wells, which manifestly shews how the spirits evaporate; but this objection rather confirms than destroys our *position*; for suppose that the spirit in the water, either were, or
were

were like to any thing that arises like a sulphureous vapour out of the wells, certainly it must have the same effect during the time it is evaporating, and the water, when warmed, would emit a *suffocating, stupifying steam*, which is by no means the case with our waters, as we have already shewn.

This sulphureous vapour is not to be looked upon as an *essential part* of the mineral waters, but as meerly accidental; for the question is not, whether a *sulphureous spirit*, which the waters cannot fix in themselves, does not now and then rise up and spread itself through the openings of the wells; but the question is about the spirits which properly belong to the mixture of the waters, and are incorporated with it, and also unite the other ingredients with it. That this spirit does evaporate, it no ways appears, nor can any man prove it.

And though what is distilled from the fresh waters has something of a burnt taste, yet no body can look upon this as a spirit, for there is no difference in the taste between the first drops and the last, nor have they any effect in *solutionibus* or *precipitationibus*.

If it be asked, what becomes of the spirit, and where does it remain, seeing it does not evaporate, and yet is so soon lost? this difficulty will be very easily solved by shewing, 4^{thly}, that this spirit unites itself by degrees with the *alkaline salt*, or with the *subtile sweet alkaline earth*, of which in all mineral waters there is always some quantity found, and makes of it a *sal enixum*, or *neutrum*, like a *tartarus vitriolatus*, *sal polychrestum*, or rather like a *sal mirabile glauveri*.

There is no rule in chymistry more common, true, or less denied, than that *acid* things and

lixivious

lixivious salts, or *alcalia*, when put together, do unite the one with the other ; at first they struggle and bite one another with great violence (to speak as the chymists do,) which occasions a great noise, a great deal of froth, and frequently heat ; presently upon this, they are closely bound together, and of them two is formed a third *salt*, which is neither *acid* nor *lixivious*, nor *tasteless* like a *terra alcalina*, but altogether *saline*.

The salts that arise from this union are called *salia neutra*, or *enixa*, as common salt, *salt-peter*, *allum*, *sal polychrestum*, *sal mirabile glauberi*, &c. some of which are formed by nature, others prepared by art ; and the acid which before was so volatile and spirituous, does afterwards cleave so fast to the *alcali*, that frequently it cannot be separated from it by the strongest fire.

Now seeing the *mineral spirit* of *steel waters*, according to the opinion of most, both ancient and modern physicians, does chiefly consist of an *acid*, according to our first position, and that modern authors agree, that in all hot and cold mineral waters, there is not only a *lixivious salt*, or an *alkaline earth*, but that the *alcali* predominates in them, so that the *acid spirit* cannot evaporate, but must, according to the already mentioned well known rule, combine or unite with the *alcali*, when it meets with it in any liquor, and thereby form a *sal enixum*, or *neutrum* ; and we have already mentioned what quantity of the said salt is contained in a pound of our waters ; we have already distinguished between a volatile and a fixed *spirit of sulphur* in the waters. The volatile, sulphureous, and *fat acidum*, cleaves to the particles of iron, and by its peculiar property, which all *artificially prepared acids* have not, defends itself against the *alcali* in the water, till it be overpowered

powered by the air and the heat ; but the *fixed acid* is already united with the *alkali*, while under ground, and with it constitutes, as we have already said, the greatest part of the bitter *mineral water salt*.

When the chrystals of this salt are exposed to the eye, they are very like the chrystals of salt-peter ; but when examined with a magnifying glass, they don't appear to have so many angles and other figures intermixed as salt-peter, and they are all small oblong *parallelograms*, with four sides, and the uppermost and undermost sides are broader than the two remaining horizontal plains are ; when this *salt* is freed from the *volatile spirit of sulphur*, either *per retortam*, or by *calcination* in a smelting crucible, and chrystalized anew, all the before-mentioned figures appear great, beautiful and transparent, and some of them are half an inch long, and in breadth about $\frac{1}{4}$ or $\frac{1}{8}$ of their length, others of them appear short and thick, but all quadrangular.

If you dry this salt gently, you may make of it a powder white as snow ; it has the gentlest taste of any salt whatsoever, it is cooling and perfectly bitter, but it has not the least taste of *alum*, as some authors have falsely pretended. The chrystals are so solubile, that if you put half an ounce of water, and as much of the *salt* in a glass, the salt by the gentle heat of the hand, and by turning it over and over, will change into small grains, which cannot be done with any *sal neutrum*, except *tartar. solub.* and *terra foliata tartari*, and even these not so well. If you let the *dissolved salt* stand in a glass in the open air for some days, it rises above the water, and forms all kind of figures, as salt-peter and some other salts do.

If to the solution of the fresh salt you put a small quantity of a sharp dissolved lixivious salt, either that of *pot-ashes*, or *salt of tartar*, it will precipitate a small matter white as snow, which will by degrees fix upon the bottom like small bits of cotton ; and if you separate it from the water edulcorate, and dry it, you will find it to be a fine *alkaline earth*, which will fret with *acid things*. But you cannot observe any effervescence in this salt itself, when mixed with all kinds of *acid* or *alkaline* things ; yet it is remarkable, that though the oil, or the heavy *acid of vitriol* will not ferment with the *salt*, yet if you pour it upon the fresh salt, when it is neither distilled nor calcined, and mix them together, there will presently arise a *volatile-penetrating-acid-sulphureous spirit*, and will continue very sensibly for some time.

From what has been said, it is evident, that a part of the *natural acid* in our waters is much more delicate, subtile and volatile than the common prepared *acid of vitriol*, which in this experiment drives away the *natural volatile acid* from its *alkali*, and fixes itself in its place. If you pour the oil of vitriol upon *tartar. vitriolat. glauber salt, or Epsom salt*, you will observe no penetrating spirit rising up, because in these *salibus neutris* the *acid* is as strong, coarse and heavy, as the oil of vitriol itself.

If you make the fresh salt of our waters pass through a glass ritorte, the *volatile and most subtile part* will be separated from the *acid spirit*, and will, like the most *volatile spirit of vitriol*, penetrate with a strong sulphureous smell, through the joinings and clay of the still. This is the true *spirit of the mineral water*, which so many persons have hitherto hunted after to no purpose ; from three quarters of a pound of our salt, after having dried

dried it perfectly well, I had above three ounces of the acid volatile spirit, to which one must smell very gently, if he would not be half run through.

Whatever may be said of the best *spirit of vitriol*, may be said also of this *liquor*, it had a strong taste like the not *rectified spirit of tartar*, its colour was a *reddish yellow*, and when put upon silver, it made black spots in it. There was something of a black foot in the neck of the retorte, and which is very remarkable, above a grain of perfect sulphur. In a smelting fire, our salt melts with an ordinary heat, more easily than *tartarus vitriolatus*, and becomes as fine and thin as water: if you throw a little *pulvoriized small-coal* upon it, or any other *fat oily thing*, and cover the crucible well, letting it stand for some time upon the fire, you shall have out of it a *hepar sulphuris*, and you may observe a blue flame, and the usual sulphureous smell rising from it.

This *hepar sulphuris* has all the properties and effects of common sulphur, when it is mixed and smelted with a *lixivious salt*; if you dissolve it in water, and pour distilled vinegar upon it, you will have *lac sulphuris præcipitatum*, which being dried and put into a glass or earthen vessel, by setting it upon hot sand, may be reduced to a formal yellow sulphur, and out of this may be prepared an acid *spiritus sulphuris per campanam*, with iron, *vitriol*, and with all kind of oils, *balsama sulphuris*; so that all the usual compositions and transpositions of sulphur may be prepared out of it, as of common sulphur.

In the foresaid experiment the *acid* of our salt unites itself with the fat of the coal and other combustible things; and thus of the *fat* and this
acid

acid is formed a *real sulphur*, but the *alkali* in the salt forms the *hepar sulphuris*.

A real true sulphur in no manner of way can be prepared with the acid spirit of common salt and salt-peter, and other acid spirits; from whence we may safely conclude, that the *acid spirit* of our *water and salt*, is the acid of sulphur or vitriol; seeing this acid alone is only fit, together with a fat, to be formed again into a sulphur, such as it was before in the stones.

If our salt after it is freed from the *volatile spirit* by *distillation* or *calcination*, be compared with any of the known salts, which are prepared of the acid of sulphur or vitriol, and a fixed alkali, it will be found to resemble the *glauber salt* as much as any other whatsoever; neither is it unlike the *English Epsom salt*, but the quality by which it is distinguished from both is, that a part of the acid of this salt is more delicate, subtile and volatile, and also contains in itself some *subtilized* particles of a *combustible substance* out of the stones, so that by the common acid of vitriol, and also by distillation it can be forced from its alkali, which is not the case with the *glauber* and *Epsom* salts.

If this simple truth, which has been explained under the fourth position, be duly considered, viz. that the *sharp and acid spirit of the mineral waters* does not evaporate, but that uniting itself with the *alkali*, it forms *salia enixa* or *neutra*, and if the several alterations of the waters be rightly observed, our fifth position will be thereby greatly confirmed, which is, that the *acid spirit* of the waters, by uniting itself with the *alkali*, must let fall all the dissolved particles of *iron* which it had assumed, and so the waters must lose all their *vitriolick qualities*.

It has been already shewn that the waters contain a perfect *steel*, both from the reddish yellow earth which lies about the wells, and which, when smelted, is attracted by the loadstone, and also from the yellow matter or substance, which being separated both from the water and the other contents, and then smelted, is also attracted by the loadstone; and it is certain, that the *Pyrmont* waters are so rich in steel, that no waters I know, can be compared to them in this point, and this will be manifest to any body that will be at the pains to compare the sediment of a like quantity of any other chalibeat water with ours, and it will appear that there is not only less of the reddish yellow matter in it, but also that the colour of the other sediments is much paler than that of ours; and any person of experience in examining mineral waters, may easily satisfy himself about it.

That the *steel* is united with the *acid spirit* of *sulphur*, and thereby forms a delicate *vitriolum martis nativum*, is evident both from the taste and smell, and from the known proof with gall, which in our waters makes a saturated purple-blue and reddish colour, is so manifest, that all authors with one voice acknowledge, that there is vitriol in all mineral chalibeat waters; but as all such waters intirely lose all vitriol qualities when put upon the fire, or when only exposed to the open air, so that there does not remain the least appearance of a real *vitriol*: this has confounded all authors, so that some have said one thing, some another, but none of them has either found out, or explained intelligibly the true causes of the wonderful loss of the *vitriol*.

It is well known that metals of all kinds when dissolved by acid spirits, and brought into a transparent liquor, will, by mixing a subtile *alkaline earth*, or lixivious salt with them, be snatched from them and fall to the bottom, the *acid* joining itself more easily with the *alkali* than with the metal, so that this needs no further explication; and when we have shewn that there are such like *combinations* and *precipitations* in mineral waters, then all the great difficulties which learned men form to themselves, will fall to the ground; viz. how to explain why the vitriol is so easily lost, either in the open air or by a gentle heat? and why it is impossible by art, to draw any vitriol from such kind of waters?

Vitriol is not of such a nature as to be destroyed by a gentle fire, as long as it has enough of water or moisture by it, and yet it cannot be had out of waters, in which, when they are fresh, it is observed to be, by divers properties peculiar to it.

It is with the *vitriol* in mineral waters, as with a *solution of common vitriol*, when an *alkaline lixivium* is poured upon it; the acidum lets go the metal, and unites itself with the *alkali*, and with it makes a *tartarum vitriolatum*. The salt is formed after the same manner, and is of the same kind, and does not differ from it in any essential point; and when it is thus formed, the metal, steel or iron, which was dissolved by the acid, falls to the ground like a yellow powder.

All the phænomena which one observes by inquiring into the mineral waters, do agree with this position, and may be clearly explained by the same. *E. G.* why so many globules of air arise out of the mineral water when it is warmed? whenever new combinations of different ingredients in the waters happen; whenever an acid

particle unites itself with an alkaline, the air is forced out of the interstices and pores of the bodies, and extending itself into small bubbles, and being lighter than the water, it is pressed up to the surface. How many thousand globules of air will arise from a small piece of metal, when it is dissolved by an acid spirit, and incorporated into it? On the contrary, when spirits fly out of any liquid, they go incognito without any tumult, such as *volatile, burning, or smoking spirits*; there is no noise, no air-bubbles.

Whence is it that the waters after some time cannot receive any tincture from gall? This is no more to be wondered at, than that ink loses its blackness and becomes brown, when any alkaline lixivium is mixed with it. In neither of these liquors does the iron or the acid of vitriol vanish, but their particles are placed and combined after a different manner.

Whence is it that so spirituous a liquor does so easily turn to a flat insipid water, and yet according to our hypothesis, the spirits are not evaporated? This happens just after the very same manner, that the most corrosive *aqua fortis* may presently by a little *alkaline salt* be made so blunt and mild, that one may afterwards eat it without receiving any injury, the spirit does not evaporate, but all that, which before made the *aqua fortis* so sharp and spirituous, is yet in the liquor, and is to be found in the newly formed *sale medio*, and may be brought out of it again, just as, we have already observed, may be done with our mineral water salt. From hence it is also easy to explain why hot mineral waters are not by much so sharp, nor have so much of the wine taste as the cold waters and precipitate the iron sooner; for the great heat which follows upon such like precipitations
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and combinations, &c. as are occasioned by the acid spirit that is in mineral stones, is in a great measure already over, while these waters were under ground, which alterations the cold waters do not undergo till they are above ground. And here it may be proper to consider, the principal and most specious objection which can be made to our hypothesis, *viz.* why is it so long before the *acid* and *alkali* unite the one with the other in our mineral waters? why must the waters be warmed so long before this combination ensues; whereas on the contrary, chymical *acids* and *alkalis* do unite with great force, even in a moment?

The causes of this difference are as follows:

First, As we have already shewn, that though the spirit of our mineral waters be the *acid of sulphur* or *vitriol*, yet being a *natural spirit*, it differs from the common *spirit* prepared by art, and is mixed with a certain *subtilized fat*, whereby it is made more *gentle, delicate* and *volatile* than the common spirit of sulphur or vitriol; and it is from this mixture of *subtile fat*, that the *spirit* seems to have its property of cleaving so close to iron, as a metal which has in itself a great deal of *combustible substance*; when this *subtile fat substance* is, by means of the *air* and the *heat* which put all its parts into a new motion, separated from the spirit, then also its particular *nexus* with iron ceases, and the acid spirit passes intirely over to the subtile alkaline earth; so that it is this fat and the iron, which keeps the acid a long time from mixing intirely with the *alkali*.

Secondly, The natural mineral *alkali* is not so *sharp* nor *insinuating* as the *artificial* is, as may easily be seen, if the *mineral salt* be dissolved in water, and if dissolved salt of *tartar*, or a *clean lixivium* of *pot-ashes* be poured upon it, it will precipitate

a *subtile alkaline earth* from the salt, and join it self with the acid in its room, and the *alkali* will remain still in the water, without having any effect upon the acid, till such time as the air and heat cause a new motion in all its parts.

The *natural acid spirit* as well as the *natural alkali*, in chalibeat waters has its peculiar character and property, by which they are both remarkably distinguished from such as are *artificial*; the *natural acid spirit*, as long as the water is not moved by the air, and the heat, continues to cleave fast to the particles of iron, and does not presently mix with the *alkali*; but it is not so with the *artificial acid*, for as soon as an *alkali* approaches it in any liquor, it presently joins itself to it, and leaves the dissolved metal, whatever it may be; yet this is not an essential difference, it is only in degree and time, and what the *artificial* effectuates in a moment, the *natural* performs but very slowly. And this is the true way to explain the several phænomena observable in the mineral waters; for other opinions are partly too subtile and incomprehensible, and partly contrary to experience and the testimony of our senses.

We come now to explain our sixth proposition, *viz.* That the *subtile sweet alkaline earth* in the mineral waters does far exceed the acid spirit in quantity, so that they must operate rather as an *alkali* than an *acid*. And here we must shew what proofs we find of an *alkali* in our chalibeat waters, and that the acid spirit is far from being sufficient to saturate all the *alkali* in them, but that in proportion there is still a great quantity of *subtile alkaline earth* remaining over and above.

And, first, the fresh water ferments strongly with all kind of *acid things*, E. G. wine, vinegar, spirit of nitre, salt and vitriol.

Secondly,

Secondly, It is not turned by the syrop of violets, and the juice of red cabbage, into a grass-green colour, but becomes somewhat greenish; and when such like juices, by being mixed with *acid things*, become of a high red colour, it restores them again to their blewish colour.

Thirly, A solution of *common vitriol* does first trouble the waters, and then by degrees intirely precipitates without any noise or effervescence, but the solution of sublimite does not trouble the water at all, much less does it precipitate a reddish-yellow, orange-colour'd powder, as other sharp *alkaline waters* use to do, for it requires a sharp *saline alkali*, to bring this colour out of the sublimite, bare *alkaline earth* will not do it, E. G. crabs eyes, prepared muscles, and the like. It is manifest that, that part of the *alkali* of the waters, which is the most subtile, and fittest for mixing with the salt, is bound up by the acid particles, and that the remaining part of it is not *subtile, saline, and sharp enough* to insinuate itself into the composition of the sublimite, and to precipitate the mercury, and give it a reddish-yellow colour.

Fourthly, When the *Pyrmont* water is mixed with sweet milk, and boiled with it, it rather hinders it to coagulate, than any manner of way disposes it for it, which would not happen, if the *acid* had the advantage or predominated in the water. These experiments clearly and fully shew the *alkaline nature* of the waters; we shall now shew, that after the waters are all evaporated, there remains an *alkali* behind.

We have already shewn that the most subtile *saline, alkaline* part is bound up with the acid in the bitter salt, and that after evaporating the waters, there remains an *earthy alkali*, which has nothing of *salt* in it, will now appear. When

the *sal amarum neutrum* is separated from the sediment of the water, there remains behind about two thirds of a tasteless reddish yellow earth, of which there is about 14 or 15 grains in one pound of water; of this there may be two grains reckon'd for iron, and about one third of it is a *materia selenitica*; so that there remains about eight grains of *cremor and subtile alkaline earth*, which will cause an effervescence and froth when mixed with *acid things*, and almost wholly dissolve, and this *alkaline earth* is white as snow, and as fine and delicate as prepared mother of pearl, and it is inferiour to no *alkaline earth* in subtilness and virtue, which may be easily conceiv'd, seeing it cannot be discovered in so transparent and clear chrystal water.

In my opinion, it is not difficult to discover the original of this *alkaline earth*; the *Pyritæ* have not only *sulphur* and *iron* in them, but as they have the name, so they are really stones, and have a great deal of a stony hard substance, some more, some less; in some it is coarse, in others subtile, fine and soft. When the *acid sulphureous spirit* and the iron, which is in these stones begin through the moistening of the water, to operate the one upon the other, the stony substance is affected at the same time, and is penetrated, subtilized and dissolved by the *mineral spirit*; the subtilest part of the same mixing with the salt, joins itself to the heaviest part of the acid, and so constitutes our *bitter mineral water salt*: when above ground the iron is separated from the acid spirit, a part of the *alkali* is saturated by this *acid*, another part is the above mentioned *alkaline earth* or *alkali terreum*, and another part of this stony substance, is intimately mixed with something of an *acid sulphur*,
and

nd constitutes that matter which we made mention of in our seventh position, *viz.*

That there is in the *waters* a *clean, transparent, crystalline tasteless substance, like a lapis selenites, or like small mountain crystals.*

When the water is distill'd very gently and slowly, and after it is almost wholly evaporated, this crystalline substance places itself all over the *alkaline cremor*, and the slower the waters are evaporated, the greater the crystals are, which sometimes cannot be well distinguished by the naked eye, but in a magnifying glass they appear in small white shining particles, all made up of clear transparent prickles, presently they become larger, and appear ty'd like small brooms, there being a great many of them closely compacted and tied together at one end, and at the other end divided into a great many points; sometimes they appear like so many small, thin, transparent *lamellas*, and *quadrangular, oblong, flat small figures*, which manifestly represent the *lapis selenites* to the naked eye. This matter is perfectly tasteless, does not grit under one's teeth like sand, but is soft like the *selenites stone*.

These crystals when either put near a gentle fire, or calcined upon a good fire, lose all their shining and transparency, and turn to a powder whiter than snow, but it is not at all like lime; for it has no heat if you pour water upon it, nor is there any effervescence when it is mixed with acid things, so that it has all the chief qualities of the *selenites stone*.

The reason why I compar'd it to the mountain crystal is, because this matter, according as the evaporation proceeds, quick or slow, turns into crystals that resemble long spits and needles, whereas the *selenites stone* does commonly form it

self into thin small leaves one upon another, and sometimes into clear broad Plates. And this may suffice concerning the volatile and fixed ingredients and contents of *Pyrmont* waters.

CHAP. III.

Of the chief virtues and effects of the Pyrmont waters upon humane bodies; and of the diseases which have been cured thereby.

AFTER having fully examined and consider'd the mineral contents of the *Pyrmont* waters, and what distinguishes them from common water, with the several remarkable circumstances relating to them, we must now consider their virtues, effects, and manner of working.

The mineral waters work according to all their incorporated ingredients together, and the safest and surest way to learn the virtues and advantages of any water, is, by repeated experience and manifold examples; and we are not to reject all considerations *a priori*, providing we do not take for our foundation a chaos of chymical ingredients, but the true anatomy of the several different parts of the contents of the water, for hereby we attain to a reasonable practice, and hereby is experience confirmed, and render'd unchangeable; for otherwise it often happens, that physicians in their water descriptions contradict themselves, and say so many absurd things of the virtues of their water, that what one establishes to day is confuted by another to morrow.

Before

Before we take into consideration the common effects of the water, we will first consider and set before you these positions, we have already demonstrated.

First, The acid spirit of sulphur.

2dly, The vitriolum martis nativum.

3dly, The salt.

4thly, The steel or iron.

5thly, The alkaline earth. And,

6thly, The crystalline substance.

Each in particular according to its peculiar known properties and effects.

The first is the *spirit of sulphur*. That acid of *sulphur* and *vitriol* is of the same species, is a thing agreed upon by the most learned chymists, and they can, as often as they please, without any difficulty, make vitriol out of sulphur, and with the acid of vitriol make sulphur, one out of the other.

That the spirit of *sulphur* and *vitriol* is a medicament, which without any mixture of any other thing, may be taken without any danger or hurt, to 10, 15 drops, and sometimes a scruple and more, is agreed upon by the learnedest and most experienced practitioners.

And this acid is so far from doing any hurt, that when it is taken with due regard to the constitution, and in due time and order, it strengthens the stomach, restores lost appetite, destroys the superabundant bitterish sharpness, both in the stomach and bowels, and also in the blood, and carries all such matter entirely off by urine. This *acidum* has been found of great use in hot fevers, especially in those that are infectious, and it is usual to mix in drink 12, 15 or 20 drops, whereby the very much thinned blood is a little thickned, and a putrid resolution of it prevented, &c.

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As to what relates to the acid spirit of sulphur or vitriol, which appears in our steel waters, we have shewn in the preceding chapter, that it is very like the *volatile spirit of vitriol*; such a spirit has indeed a very strong penetrating smell, but neither the *taste* of it, nor the *corroding effect*, is by any means so strong as a common *acid* of *vitriol*, or any other *acid chymical spirit*, yea it is gentler by much than *vinegar*, which we daily make use of.

The cause of the gentleness of this volatile spirit, tho' it is itself an acid of the same species as the common acid of vitriol (for the common spirit may be easily changed into a volatile, & *è contra*) we have already given, *viz.* that the *subtilized fat* that is mixed with it does indeed make the *acid salt particles* more *volatile*; but according to the manner of all oily and fat things, does blunt and remove their sharpness and pointedness, and not only this, but the spirits of this water are freed from all gnawing and corrosive sharpness, both by the dissolved iron with which they are combin'd, and by the *alkali*, as in Position 6, 7. so that it is impossible that the acid should any manner of way corrode the most soluble thing whatsoever.

On the contrary, the efficacy and virtue of such a *volatile spirit* has been so much celebrated by many chymists and practitioners, against *epilepsies*, *palpitation* of the heart, &c. and for the speedy *resolution* of all sorts of *obstructions*, that if the half of it were true, it ought to be look'd upon as an excellent remedy; but the *natural* spirit must be more excellent, than that prepared by art. This *volatile acid* according to our fifth position, is united with the iron, and with it constitutes a hard *vitriolum martis nativum*, which is the
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second ingredient we must here consider according to its medicinal properties and virtues.

A *clean vitriol of iron* is not only daily made use of, by the best practitioners, as a safe and good remedy, but they give a dose of it so far as 10, 12, 15 grains, and continue it daily one week after another. It opens obstructions in the bowels of the lower belly, strengthens the same, and by the gentle contracting virtue of the iron helps their too great relaxation, dissolves slime, kills worms, &c. The much used and excellent *tinctura martis Ludovici Tartarisata* is made out of it, and the most cautious physicians make no scruple to give the vitriol of iron to children of a week old, in *pulvere absorbente Wedelii*.

If notwithstanding all this, any person should be suspicious of the *common vitriol of iron*, and should look upon it as a *secret corroding acid*, yet let him not think the same of the *vitriolum martis* in our water, for according to the sixth position, the *alkali* predominates in the water, so that the *acid* can never have any corroding effect, for as soon as an *acid particle* is loosened from the *iron*, it is presently catch'd by the *alkali*, and so closely united with it, that it is with difficulty disunited again by the power of the fire.

From this uniting of the *acid* with the *alkali*, does our *mineral water salt* proceed, as we proved under the fourth position, and have compared it *cum tartaro vitriolato*, and particularly *cum sale mirabili glauberi*, and the *English purging salt*.

What excellent virtues, sure and gentle effects, such *salia media* have, which are formed of an acid vitriol, and an alkali, we are inform'd of by daily experience, we may also learn from the lofty titles given them, when they are
called

called, *salia polychresta arcanum duplicatum* &c. These *salts* thin and dissolve all *slime*, hardness and *obstructions* in the *stomach*, bowels, spleen, liver and other glandulous parts; they are reckoned the best *medicines* in fevers, cure all sorts of agues, and are very successfully joined *cum bezoardicis fixis* in hot fevers; are very effectual in *swellings*, *dropsies*, &c. are *strong diureticks*, and cleanse the kidneys and bladder from gravel, sand, &c. all which properties are well known; and these artificial salts are so gentle, that not only may one with safety take large doses of them, but may continue to take them for many days successively, without occasioning any gripings or uneasiness; of this nature is the salt of our water, as we have proved under the 4th head, so that there is no reason to fear any corrosion, for as much as in one pound of water, there is not above seven or eight grains, and even that mixed and surrounded with a *predominating alkaline earth*.

We come now to consider the *steel or iron*, which we find in our medicinal waters, and as *iron* in common life is the most useful of all metals, so it has had hitherto the pre-eminence, over all other metals in physick, and of it are prepared the safest, surest, and most usual medicines, yea the filings of *red Iron* are often prescribed and taken to very good purpose.

The principal medicinal effect of *iron* in human bodies, is that it strengthens and gently contracts all the bowels, in long illnesses the fibres of all the inward parts are much weakned and relaxed, and by virtue of the *julphureous, dried ferruginous earth*, they recover their natural strength and firmness, and by the motion of it's parts all slimy tartarous obstructions, if not too much hardned, are pressed out of the several canals
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of the body ; for which reasons, the *steel* or *iron* water produces so excellent effects in *malo hypochondriaco*, *morbis matricis*, defects of digestion and all obstructions whatsoever. The less iron there is in any mineral water, the sooner may the bowels suffer injury by the use of the same, by opening and relaxing them too much, and the fibres of the nerves are thereby greatly weakned, but nothing like this can happen in the use of the *Pyrmont* waters, which abound so much in iron, in which thing no waters can come up to them, so that their virtues must be greater, and their use more safe.

The difference that there is between a rich *steel* water, and a water that has little or no *iron* in it, is very remarkable in the *Pyrmont* waters, for the longer you let them stand, till the iron separates itself from them, the more do they purge, which every body experiences, that drinks them at home and at a great distance from the wells, (for sometimes by warm weather, the water is very much altered in it's mixture, and the greatest part of the iron fixes itself on the glass or earthen vessels) and we hear them often say that the waters have more effect upon them at home than at the wells, and this effect they reckon by the frequent purging. But what advantage is there, tho' the body be never so well cleansed by the salts and the water, if at the same time the bowels do not recover their due strength, firmness and contracting motion ? for when this is not the case, the hurtful humours do often gather again in the weak and slippery bowels as soon as they are expelled, so that the benefit such patients reap by the water is very small. There is one question relating to the *iron* or *steel* yet remaining, viz. *whether the steel in the water performs it's effect as a vitriol, or as a cro-*

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cus martis. It has been demonstrated in the preceding chapter, that the water when exposed to the open air, and particularly by heat, as in the stomach and bowels, by degrees loses, and lets fall all its vitriol qualities, and therein mixes itself with all kind of *acid bitter and gross earthy matter*, and especially the fat earthy particles cleave to the vitriol of iron, overcomes the same, and thereby forms a black ink colour, which we see by the excrements of such as use the steel waters. The water leaves or throws off all its *vitriolick qualities* in *primis viis*, and suppose some *steel* should be carry'd into the blood with the other contents of the water, yet it operates rather as a subtile crocus of iron, by strengthening the relaxed solid parts, than by any prevailing vitriolick qualities proves hurtful to the nerves, as some authors imagine; but particularly the predominating subtile *alkaline earth*, (which is the fifth ingredient we are to consider the effects of) does hinder both the acid and the vitriol of the waters to have any bad effect, as has been already proved; every nurse knows what effect subtile alkaline earth produces in our bodies, and there are very few recipes for powder wherein we do not see crabs eyes, oyster shells, mother of pearl, &c.

And that the *alkali* in our *steel water* is such a *subtile earth*, and of the delicate finest sort, which is dissolved in crystal clear water, we have already proved in the preceding chap. and it must have this same effect, and even greater, *viz.* to *correct and attract* to itself the *superfluous acid-bitter and saline sharpness* in the stomach and bowels, which afterwards, is convey'd out of the body by the cleansing virtue of the water.

Finally, there remains the *tasteless crystal substance* of the water, and we must consider if this has any medicinal

medicinal virtues. We have already observed, that this transparent crystal is nothing, but a pure *selenites stone*. This stone is a soft tender earth, which does not grit between the teeth, and it may easily be rubbed into a small imperceptible[†] powder. *q. impa*

If neither the powder of *crude* nor *calcined selenites* will make any effervescence with acid things, it is also well known to be the case, both of prepared mountain crystal, and of many precious and other stones, (*lapidibus pretiosis & minus pretiosis*;) which nevertheless are in great reputation with the best practitioners, for their medicinal virtues, especially the prepared mountain crystal, which is found exceeding beneficial to both old and young, against super abounding, sharp *corrosive* gall, in *loosnesses*, *fluxes*, *stone* in the *kidneys*, *palsies*, *fluore albo*, &c. and is often given to nurses to increase their milk.

Tho' the *materia selenitica* is not so hard and firm, yet in other things it may well be compared with the *substance* of the *mountain crystal*, and upon the account of its tenderness and softness appears to have more free entry into, and greater effects upon the humours of the body, and accordingly in my practice I have often made use of, not only the crystalline matter, but also of a pure *selenites stone*; in such cases in which the mountain crystal is recommended, and that both by themselves and mixed with other things, and always they have *effectum precipitantem*.

Moreover the *lapis selenites* is not only made use of, for mechanical and external things, as paint for ladies, &c. but some very experienced physicians have made use of it as an excellent *antispasmodicum* against the *Epilepsie*, *paroxysms* of *the ague* and the like.

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These are the properties, virtues and effects of all the *ingredients* which constitute the mineral contents of our water, and where the hurtful corrosive qualities lye, or what ingredient does corrode, is impossible to be discovered; on the contrary every one acquainted with the *materia medica* will confess,

First, That the *Pymont* waters, according to the proven virtues of the several parts of their mineral contents, deserve rather to be called sweet than acid.

2dly. That every Day salts and other things are prescribed to the weakest sick people, and such as are affected with inward distempers, which are sharper and more griping than the contents of our waters, and consequently all frivolous pretences about the sharpness and great strength of the water, &c. proceeding partly from envy, and partly from ignorance, do now fall to the ground. We must now consider further how the fresh *Pymont* waters, with their united mineral contents, do operate in our body, and what are the effects that men commonly experience by them. The most obvious and best known operation of the waters, when drank in due measure is, that they greatly increase all the natural *evacuations* and *ejections* performed by the several organs of secretion and cleansing of the whole body.

With some persons the water occasions a strong salivation, which continues for some days, and carries off a great deal of phlegm or slime, through the glands of the mouth, throat and wind pipe; it affects the stomach also, and causes vomiting, and thereby a great deal of filth is thrown out. It also carries off by stool the gross humours lodged in the bowels, this frequently lasts for some days and occasions a very

sensible

fenfible heat in the body. But for the moft part it paffes through the kidneys and bladder, and many perfons do daily make more water, or at leaft as much as they drink. It occafions a fweat over the whole body, and even to fuch as fweat with great difficulty, or complain that for fome years, they have never been able to fweat regularly; and when the humours are very falt and full of gall, it occafions an out-breaking over the whole fkin, which ordinarily is foon gone, or is removed by bathing at the end of the cure. The ordinary bloody fluxes both in men and women, which are attended with fuch bad confequences, are cured by the waters in a more fafe and fure manner, than by any other known method whatfoever.

Thefe feveral cleanfings of the body are carried on in fo gentle a manner, if men proceed regularly, that no medicine is to be compared to it, and altho' fome have reprefented it as too ftrong, yet all that have drank it regularly, know the contrary by experience.

And not only does it vifibly produce the forefaid effects, but according to the parts of its mineral contents, it muft alfo produce thefe following effects requifite for reftoring of health, *viz.* it corrects the faline bitter and fharp humours of the ftomach and bowels, alfo changes and fweetens the whole mafs of humours, and it diffolves, attenuates and feparates, all obftructions of the lungs, kidneys and fmall veffels of the body, and carries off all kind of impurities through the feveral excretories.

And as it is very common in broken conftitutions and weak bodies, tho' ever fo well cleared of all hurtful humours and obftructions, yet they eafily breed and grow again. But by the ufe of

the waters the tone and elasticity of the solid parts and fibres is, by means of the *sulphureous balsamick ferruginous earth* contained in them, restored and strengthned, and thereby all new gathering of hurtful matter and juices in any parts of the body prevented and hindered; so that all these things considered, it is evident, that when among all the means of recovering health, any one shall be found deserving the name of a *panacea*, it must certainly be the mineral waters, and according to the forementioned circumstances, the *Pyrmont* water must be one of the best. And particularly, God has provided the mineral water as a singular remedy against all chronical distempers (except a very few) provided they be not too much rooted and inveterate; and in the opinion of the learnedest and most expert practitioners they are the last *asylum*, after men have gone over all the *predicamenta remediorum* to no purpose.

So that it is abundantly evident by innumerable instances, that it has a wonderful effect in manifold distempers, to which human nature is liable, as those of the *head*, *apoplexies*, *delirium*, *loss* of sleep, and all defects of the outward senses, all diseases of the breast, and ailings of the lungs, by sweetning the sharp saline humours, tempering the boiling heat of the blood, and strengthening the parts by its contracting, healing and balsamick virtue; and here it is to be observed, that in diseases of the breast, it must not be drank cold but lukewarm, otherwise by its coldness it may prove hurtful. It is also good against all disorders of the stomach, loss of appetite, defects in the digestion, palpitations of the heart, &c.

And in the bowels, against all pituitous, flatulent and bilious cholicks, destroys and carries off all worms, when all other means fail, and also
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in paralytick disorders, convulsions and cramps, scorbutick eruptions and spots, swellings and gouts, &c.

It attenuates, separates and sweetens the thick viscous sharp and bitter blood, cures both the beginning and remains of the *lues venerea*, *scurvy*, *cachaxies*, &c.

And in women it cures all obstructions of the *menfes*, *green-sicknefs* and *decolorationes mensium*, *relaxations* of the *matrix*, and parts belonging to it, *barrenness*, &c. I could confirm all this by manifold examples, and thereby compose a compleat course of medicinal history and cures performed by the *Pyrmont* waters, which would give great light to practice, with respect to mineral waters, but must delay it till another opportunity.

C H A P. IV.

Of the way and manner of drinking the Pyrmont waters, so as to profit thereby, both with respect to the season, preparation, quantity, order, cold, or heat, continuation, diet, medicines, according to the difference of age, sex and constitution, and how to obviate and prevent accidents and obstacles during the cure; and lastly, concerning the effects of the water after the patient has left off drinking.

Hitherto we have given an account of the virtues and effects of the waters for recovering the health, and now we shall lay down certain rules which are to be observed in the use of them, in order to attain so excellent an end; and so much the more necessary it is to do this, because experience teaches us, that not only the mean

for recovering of health, but even our natural nourishment, if not made use of in due measure and order, does more hurt than good, and instead of helping, does really destroy the body.

The first thing to be consider'd is the *season* ; we have already observ'd that our waters have a like virtue in all times and changes of the weather, so that at all times of the year, when it is judged fit by a skilful physician for the patient, wearied with other medicines, the waters may very safely be used ; for there is no month in the year wherein we cannot shew, that the waters have had the desired effect ; but seeing the waters are mostly drank cold, and the cure is in itself rather temperate and cold, than hot, so it may easily be observed that the months of *May, June, July* and *August*, are the most convenient ; for in this season there is better opportunity for motion and exercise of the body in the open air, and taking such diversions as are very necessary during the cure.

As for such as cannot drink the waters at the wells, it is to be observed, that it is best for them to drink them in the months of *March, April* and *May*, before the heats come on ; for the waters being then carried to very distant places, are heated upon the road in the day time, and cooled again in the night, whereby their spirituoufness is very much abated, and the steel particles thrown upon the sides of the vessels wherein the water is contained, which does not happen when the water is drawn and carried away in cool weather, and afterwards put into cool cellars till it be used.

Some physicians are for beginning to drink the waters a week, or three or four days before the full moon, that so they may have done by the end of the moon, when the humours of the body

dy are more easily purged away ; but as no body can know before-hand how long they must continue the cure, which depends upon the effect the waters have, therefore this method seems to have very little in it.

The most proper time of the day is the *morning, fasting*, after the body has been strengthened and refreshed by rest ; for then the several excretions occasioned by the waters are best performed ; and it is best to wait till the sun has dispelled the moisture of the night, and warm'd the air a little, before you begin ; and it seems best to get up about five a clock, and before six, or there-about, the moisture upon the body occasioned by the bed will be mostly over, and then from six to eight is the most convenient time, even for such as take the largest dose ; and in four hours, *viz.* from eight to twelve, which is the usual hour for dinner at the wells, the waters have their greatest effect, provided they pass tolerably well. When you begin too early, you are in danger of suffering by the cold, and by waiting too long for dinner after you have done drinking, the appetite becomes too strong.

It has been an old custom about four of the clock in the afternoon, after the digestion is finished, and the stomach disburdened, to drink some glasses of the waters ; but this is no necessary part of the cure, though it may be done if one be thirsty, and has a desire to it ; but to drink as much in the afternoon as in the morning, as some have done, is certainly very hurtful ; for it is contrary to all reason, when nature is employed to prepare and distribute the nourishment for the preserving and strengthening of the body, then to divert it from its work, and put it upon excretions and evacuations.

2dly, We must consider the *preparations* for the cure. They that are used to let blood about the time of the Equinox, ought not to omit it, if they design soon after to make use of the waters, and it is very proper for such as have much blood and very hot; and experience teaches us, that it is best for most patients to do it some time before they begin, considering that the stomach and other internal parts, after letting of blood, are with many for some time more tender and weak, and so more easily hurt by the coldness of the waters; and considering that some are more liable to evacuations, by which nature is soon exhausted, it is best not to fatigue one's self too much, and such as come long journies to drink the waters, ought to rest themselves a day or two before they begin.

Purging before you begin to drink the waters, which was looked upon as so necessary by all the ancient physicians, is now rejected by some of the modern, as hurtful or useless. It is very strange that both parties make use of such general terms without any difference, seeing the constitution and state of the body, as also diseases, with their several circumstances and accidents, are so different, that no rule here can be so general as not to have its exceptions. Sometimes the stomach, the bowels, &c. are so filled up and stopt with glutinous slime, which the water, being a gentle cleanser, cannot so soon remove out of the way; so that it is much hindered thereby in its free operation; and sometimes patients a little before have been purged and vomited, and there is no suspicion of any filth in the *primæ viæ*; so that they have no occasion to be purged again; these others may be prepared for drinking the waters by simple digestives, or opening salts; but where stronger
pur-

purgantia are necessary in *forma pilular' pulv' infus' potionis, elixiris, &c.* without which the waters will not pass freely. It is the physicians business to judge what is fit to be done, and to determine according to circumstances, and not *tanquam ex-tripode* to treat every body alike.

3dly, As to the *measure* it cannot be intirely determin'd, how much every body ought to drink, but according to every body's constitution, distemper and the working of the waters, the dose is to be measured, for with some, they operate but slowly, with others presently; 3, 4, 5, 6, pound has been found sufficient, and to operate both by stool and urine, and I never allow the strongest to drink above 8 pound. The first receive into their body about one fourth of an ounce of the mineral, and the others in proportion, which is enough for a dose, and this far exceeds what Dr. *Slare* allows in his treatise, ch. 6. § 13. And in *England* usually, they don't drink above 3 pound, which is about a flask; we are not against small doses here, nor do we approve of it when weakly persons drink too much; but daily experience shows here at the wells, that most of the water drinkers, drink with good appetite between 5 and 6 pound, and find no inconveniency by it, but very good effects, when they do it with caution, and observe our rules. On the contrary, the water gives greater uneasiness when drank in small quantity, and it is with it as with other evacuating medicines when not taken in sufficient quantity, which move, but do not carry off, consequently nature is not lightened, but more burdened thereby; this is the cause why we keep to a middle portion in the annexed measure and dose.

In what order any one of these measures and quantities are to be drank, may be known by the following rules.

1st, The glasses ought not to be bigger, than to hold one fourth of a pound.

2^{dly}, Such as are of middle age, and have strong bowels, may drink every quarter of an hour 3 or 4 such glasses one after another.

3^{dly}, Such as have not sufficient internal heat, and find a sensible uneasiness from the coldness of the water, may drink two such glasses every half quarter of an hour, or only one half pound at a time, that so the bowels may be able to warm the cold water.

4^{thly}, Tho' the said glass measure be but small, yet it ought not to be drank at one breath or draught, but by degrees, for thereby the water looses somewhat of its coldness in the mouth, and such as fear that it looses its spirit, when they drink it slowly, know not what the mineral spirit is.

5^{thly}, In this manner one may drink the first morning between 2 or 3 pound, the 2^d between 4 and 5, and the 3^d morning 6 pound, and so continue as many days one after another, as the circumstances and consequent effects shew that it is proper.

6^{thly}, One is not tyed down so intirely to this method and order, as not to dare in one morning, to drink two glasses more, and in another two glasses less; but every body is herein to regulate himself, according to his appetite, and according as it works.

7^{thly}, Caution in leaving off by degrees, is not so necessary as when you begin, for the bowels cannot then suffer so great an alteration by leaving off water, as they did when the fasting stomach was unaccustomed to the cold regimen.

8^{thly},

8thly, Such as drink it warm, may without danger drink larger glasses and faster, yet must not exceed measure and number; and the way to warm it, is to put the water fresh out of the well into a glass bottle or earthen vessel, and after stoping it well with a cork, to put it into a kettle full of warm water, till such time as it lose its great coldness, and according to the constitution and distemper, even till it be milk warm. When the waters are drank warm at the wells, they don't lose so much of their spirit, as when they are carried far from the wells, as experience shews.

For *first*, the red steel earth does not fix itself upon the sides of the vessel wherein it is warmed, as it does upon those wherein it is carried to a great distance.

And *secondly*, the waters by gall thrown into them, become as black when they are warm, as when they are cold, which does not happen when the waters have intirely lost their spirits; and indeed the waters are so full of spirits, that a small loss of them is not discernable, so that after being warm'd, they have all the same effects as when cold; moreover we know by experience, that such persons as have not been able to drink them cold, have by warming them had all the success they could desire.

The next thing to be considered is, how long the waters are to be drank; we cannot fix upon any certain number of days, but every one must govern himself according to the nature of his distemper, and the effect of the waters; some finish the cure in 10, 12, 14, days, others cannot leave them off without damage, till they have drank them 3 or 4 Weeks; and we have an instance of drinking them every day for 3 months, and also of repeating the cure twice in the year at least, with
great

great advantage to health: nevertheless the following rules with respect to the continuation and length of the cure are to be observed.

1st, The best and safest way is, not to drink too much at a time, lest thereby you do violence to nature; but rather to continue the cure 3 or 4 Weeks longer.

2^{dly}, You may begin to drink the waters for a little while in the month of *May*, and afterwards proceed in the month of *July* and *August*.

3^{dly}, When the waters agree perfectly well with you at first, and so continue, if the distemper is not inveterate and deeply rooted, the cure may be finished in 14 or 16 days.

4^{thly}, If the Waters begin only to pass very well, after you have used them 8 or 14 days, as it happens with many people, it is easy to observe, that it is necessary to continue to drink them longer, till the obstructions be sufficiently removed, and the body thoroughly cleansed.

5^{thly}, How many years, one after another, it is necessary to repeat the cure, every one will be able to judge for himself, by considering the state of his own health in the after part of the year; but we have many examples that the 1st and 2^d year the waters made no alteration in the distemper, nevertheless the third or fourth the patients were perfectly cured.

6^{thly}, Such as have been accustomed to drink the waters several years, cannot without injury to their health leave them off, for at the return of the season of the year they feel their old distempers again, which never leave them till they return to their usual cure. But it is not necessary to confine one's self to drink the waters every year, but they may forbear till such time as they feel some symptoms of their distempers, neither have they, that
drink

drink them yearly, any reason to fear that at length nature will thereby be weakned and consumed before its time ; seeing a great many persons, and some yet living, have drank them 30 or 40 years successively, and sometimes twice a year, even after they were seventy years old, and still with good success.

7thly, It is without any foundation what some pretend, viz. that the clearness of the urine, and the excrements not being any more of a black colour, is a sign that the patient ought to leave off drinking the waters ; but they ought to continue, till such time as they find their bodies sensibly eased, and remarkably altered and cleansed ; when they begin to grow weary, and to nauseate them, then they ought to leave off. And if any person is not satisfied with this advice, let him consult a physician what is fit to be done, all circumstances considered, that so he may neither have too much nor too little of a good thing.

The next thing to be considered is the *diet*, which by the antients was called the *life* and *soul* of all cures, and without it our waters signify but very little. Diet consists, not only in eating and drinking in a regular way such things as are wholesome, but it comprehends also the state and condition of the *air*, *motion* and *rest*, cleansing of the body, sleeping and waking, and also the exercise of the mind.

As to eating there is no reason to confine one's self so much as some physicians pretend, who will not allow their patients, while drinking the waters, to eat any garden herbs, and other harmless things ; but what is chiefly to be avoided is hard, heavy, sharp, acid, salt, high-seasoned victuals, all too new ill baken bread, greasy cakes and baked meat, pease and beans, bacon and pork,
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old and tough meat of whatever sort, either fresh, pickled, or dried in the smoak, all glutinous and slimy parts of animals, as calves heads and feet, brains, liver, salt and dried fish, all slimy and viscous fishes, such as, old pikes, tench, eels, &c. all raw fruit, melons, cucumbers, mushrooms and salads, whereby the bowels are filled with slime, relaxed and cooled, which occasion hurtful loosenesses, cholicks, &c. But there are a great many things in kitchen gardens, which may not only be eaten with safety, when young, tender and well done, but are very proper and fit nourishment for such as drink the waters, for they gently open the body, and so promote that which the waters, generally speaking, do occasion to most patients; but we except such persons as either have an aversion to garden stuff, or feel any uneasiness after eating it.

As to *milk dyet*, we will by no means advise it, seeing there are many who do not agree with it, even when they are not drinking the waters, and it might, in the mean time, dispose them to loosenesses, but that it is so dangerous and hurtful as some physicians would make it, as if the acidity of the water did curdle the milk, is both false, and without any foundation, for we have proved that the waters by their predominant alkaline earth rather hinder than occasion the curdling of the milk; and as it is usual to prepare the body for a milk dyet by alcalis, so I have found by experience both from myself and others, that a milk dyet agrees better with one rather after the cure than before it, and even during the cure, by many instances I have found it to be harmless and innocent, and very lately a hypochondriacal person of a very weak constitution, who lodged in my house, did for 4 weeks every evening sup upon
sweet

sweet milk and bread, and next morning drank 4 pound of *Pyrmont* water, which had so good effect, that he was happily cured of his distemper.

It is not fit to dine till 4 hours after having done drinking, so that they who drink from 6 to 8, ought to dine at 12, and they that drink from 7 to 9, at 1 o'clock, and tho' the waters should pass in 2 or 3 hours or sooner, yet it is best to let it be full 4 hours before eating, and to eat nothing at all before dinner, that so the waters may work without any disturbance.

The patient may eat heartily at dinner, providing he don't eat too fast, and chew it well, for commonly the waters sharpen the appetite, so that many eat too fast, and their victuals not being sufficiently masticated, do often occasion indigestions, and several other inconveniences, and as variety of dishes tempt to eat too much, and so over load the stomach, it is better to choose one good dish, that so too much eating may not delay or hinder the cure.

Supper must not be too late, not after seven o'clock, a small sopp and a little boiled meat, which is better than roasted, it must be something that is easily digested.

People of distinction are frequently too negligent with respect to this article; for as they usually frequent balls and other diversions, they cannot leave them off while they drink the waters; they sup at 9, 10; or 11 a clock, when by protracting the time of supper, and motion of the body, their appetite is sharpened, and they eat more at supper than dinner, and presently after go to bed; so that they have a restless night, and in the morning, which is the fittest time for the waters, their body is quite tired, and their stomach full of crudities.

As to *drink*, it is best for every body to make use of that they are most accustom'd to, and which agrees best with them; and if they make use of beer, it ought to be good and fresh, neither too new, nor too old, but well boiled, clear and brisk.

It is a gross mistake to think that the waters weaken the stomach, therefore it is necessary to strengthen it with wine, for on the contrary the *Pyrmont* water fortifies the stomach, as experience shews, for many, who having entirely lost their stomach, through long loofnesses, *lienteries*, &c. have perfectly recovered it by the use of the waters, and such as with any reason complain of weakness of stomach after the cure, owe it wholly to themselves, having either by a disorderly diet, drinking the water cold, or too much at a time, brought it upon themselves. However, a glass of good wine at meal-time taken moderately is of great service during the cure, for thereby the stomach is warmed and fortify'd, the digestion forwarded, and by its diuretick virtue the remainder of the water carried off, good *rhenish* wine, neither too acid, nor too strong, is best, for old strong *rhenish* wine ought rather to be taken as a medicine in small quantity than otherwise; good *French* wine is also of great service, and indeed the choice of the wine ought to be left to every body's liking, only wines that are strong and apt to heat the body, are to be made use of as cordials, and small wines are most proper to quench the thirst.

If one be thirsty about an hour or more after eating, a dish of tea or coffee can do no hurt, providing one don't drink too much of it, and thereby relax the bowels too much; and I don't think it advisable to drink *Pyrmont* water at meals,

or to mix it with wine, tho' the inhabitants thereabout are accustomed to drink it without any inconveniency, but to such as are not used to it, it must prove hurtful, for it carries the victuals too soon out of the stomach, which is very prejudicial.

The next thing to be consider'd, is the *air* and *the weather*, and tho' these are not in mens power, as eating and drinking, yet they ought to consider how their bodies are affected thereby, and as the air constantly furrounds, and presses upon our bodies, the pores, and also the motion of the liquids in the external parts of the body, are much alter'd, changed, and insensible perspiration sometimes increased, at other times much lessen'd, or intirely taken away thereby; and the several changes of the weather occasion various changes in the body; so that the effects of the waters upon the same person and disease, are not always alike, but exceeding different and various. Tho' a *temperate, warm air* is best for drinking the waters, yet this not depending upon our choice, it frequently happens, that we have a hurtful, cold and moist air, as well in the *Dog-days*, as in the month of *March*, and if at such a time one is either drinking the waters, or come to the wells for that purpose, he must not wait for good weather, but must go on, and guard against the bad effects both of wind and weather, the best he can; and the best and safest way is, to warm the waters a little, as if it were in winter, and to keep by a good fire, and in a large room, where there is conveniency for walking. And as there are some persons very phlegmatick and weakly, who cannot endure the cold, it may be proper for them to drink it in bed, and a very little warmed, providing they don't make a custom of it, but
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after they get up, to use so much the more motion ; but such as are robust and of a hotter constitution, and will notwithstanding the cold, drink the waters at the wells, and so enjoy a freer air, they ought to cloath themselves well, drink but small glasses at a time, and thereby prevent all hurtful colds.

Very warm air, hot and sultry weather is very inconvenient while one is drinking the waters, for too much sweating delays and hinders their good effects ; in such a season, it is best not to neglect the cool of the morning, and to frequent cool and shady places.

We come now to the *motion* and *exercise* of the body, which ought to be considered as a necessary part of the diet ; and here, care must be taken that the motion be not violent, and thereby the blood be over-heated, and so occasion immoderate sweating ; but the motion must be agreeable to the weather, according as it is hot or cold.

As to cleansing the body, great care must be taken, that it be kept open, and that the urine come away plentifully. There are many celebrated mineral waters that operate strongly by urine, but open the body very little: on the contrary, *Pyrmont* waters promote excretion both ways in such a manner, that there are very few in proportion, who have any reason to complain, and experience teaches how much it lightens the body, and of how great advantage it is, after the waters work plentifully by urine, if they occasion some stools also ; and the best Physicians advise, that when the waters themselves have not this effect, it ought to be procured by some relaxing medicines, and, indeed, when this is neglected, the consequences are very bad.

In those diseases which have their seat in the stomach, bowels and other contiguous viscera, the working of the waters by stool contributes much to the cure; but when the whole *massa humorum* wants to be altered, thinned and sweetned, and the kidneys and bladder cleared of sand and slime, or the lungs and other viscera freed from obstructions and superfluous sharp humours, the nerves strengthned and opened, and also the diseases of the external and solid parts removed, in such cases the working by urine is preferable, for whatever passes by urine, must by the circulation of the blood, be carried through all the parts of the body, seeing we know no other way it can come at the kidneys and bladder, so that the mineral waters must carry their medicinal properties through the body, and by mixing with the several humours and touching every part produce their effect.

As to *sweating* it is a very common and beneficial excretion during the water cure, for thereby a great deal of what is hurtful to the body is carried off. But sweating in the morning while you drink the waters, if they have not begun to pass either by urine or stool, must by all means be moderated or intirely prevented, for thereby the waters are by the blood carried too much towards the external parts of the body, which hinders them to be carried off either by stool or urine, which must necessarily give great uneasiness to the body, and this is the reason why such as perspire strongly, and are liable to much sweating, always find that the waters work best with them, as they call it, when the weather is pretty cool; for then their pores are more shut, and the moisture or humours of the body are more press'd towards the inward parts.

Sweating after the waters are gone off by urine and stool, and upon moderate motion, is very wholesome and beneficial; but when one begins the cure, it ought to be prevented as much as can be in the night-time, and such as are subject to it, ought to put on warm cloaths as soon as they can in the Morning, and not expose themselves too soon to the cold morning air, but walk for some time in their chambers, till it be entirely over.

The best time to sleep during the cure is from nine or ten at night, to 4 or 5 a clock in the morning, and they take best care of their health, who after supping at 7 a clock, do walk a little, and then go to bed by times, without any regard to company or diversion; for hereby they will procure quiet sleep, and greatly forward their cure.

Sleeping in the middle of the day, about which so much has been said *pro* and *con'*, may be easily prevented, by eating moderately, and not over-burdening the stomach, drinking but little wine, keeping in company, and not sitting still, &c.

The exercise of the *mind* ought also to be consider'd; for upon the temper of the mind the cure very much depends; wherefore it is necessary to guard against all *envy*, *jealousy*, *anger*, and other hurtful passions, and to use all endeavours to be of a *contented*, *cheerful spirit*.

As to physick during the cure, it must consist of few choice things, for the *Pyrmont* waters contain in themselves several rich medicinal ingredients, and so need less assistance from other medicines. The ancient *well-physicians* have made long registers of remedies, that the water-drinkers ought to make use of according to them; and indeed a patient that must go through the several classes of the *materia medica* may well be terrify'd;
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some of the *moderns* reject all physick during the cure, and commonly human understanding falls from one extream to another. It would be too tedious and by no means necessary to prescribe here for the several diseases we have mentioned, only we propose it to the consideration of practitioners, and refer it to the experience of every one, viz. *That in the cure of many distempers the waters give effectual help and assistance to other remedies.*

As to the common and ordinary medicines which patients make use of when they drink the waters; we have said something already relating to the preparation of the body; during the cure, relaxing medicines, and such as strengthen the stomach are most used, and amongst those that are relaxing, the opening and mollifying salts have the preference in the present practice, such as *tartarus vitriolatus*, *sal polychrestum*, *cremor tartari*, *sal anglicanum catharticum*, *sal mirabile glauveri*, &c. and seeing such like salts agree with the natural salts of the water, it is reasonable, when the waters do not operate either by urine or stool, to forward them by such salts, and we know by experience, when they are well prepared, they neither heat nor gripe, but pass with the water, either by urine or stool, and when it is necessary, they may be frequently repeated.

It would be best indeed to make use of the *Pyrmont water's* own salt, but there being only 7 grains in a pound of water, and the charge and trouble of preparing it being great, the salt that comes nearest to it in it's properties will answer the end; one kind of salt agrees with one, and another with another, and indeed few patients have any occasion for them, the water's own salt and virtues being sufficient. Other purgatives

are not to be rejected, and whereas both the waters and salts work sometimes only as digestives and mollify the peccant humours in *primis viis*, &c. and make them moveable, so that in a long cure, a strong purging medicine may be very beneficial and carry off intirely all filth, and not a few patients are thereby much eased, and their cure goes on more successfully, and for these reasons it is safest, and at the end of a cure, to take a purging medicine, not too gentle, that thereby all hurtful, slimy, obstructing matter, softened and made moveable by the waters, may be carried off; and such a medicine may be given in any form, as agrees best with the patient, but what they call *night pills* are best and most serviceable, if they be made of good *resolvent gums*, *extractis amaris* and such like, and they may be so prepared, as after 6 or 7 hours sleep, to work gently in the morning, and if they be taken in the beginning or middle of the cure, one may drink some water upon them in the morning without any prejudice, but towards the end of the cure it is best to drink after the pills, some tea or thin soope in the morning.

As to *stomachicks*, which during the cure are usually made use of before eating, it is not to procure a good appetite, which without them is generally strong enough, but the chief reason is, that when the digesting juices of the stomach are too much carried off and lessened by the great quantity of water, or when the stomach and the contiguous viscera have suffered by the coldness of the water, and thereby indigestion is occasioned, the gentle warming aromattick essences contribute to restore the said juices to the stomach, and the necessary heat to the bowels; but these medicines must be administered according to the constitution of patients.

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As to the difference of age ; we have already shewn that the *Pymont* waters are not to be rank'd among the strong and rough medicines, but rather among the sure and gentle ones, so that neither aged persons nor children are to be excluded from them, with this proviso, that children be not so tender and young, as not to be capable of direction, and being kept in order ; and aged persons not intirely spent and decay'd. When children are above seven years old, and old persons have some strength, other circumstances duly consider'd, we have many instances, that the water is neither too strong nor too sharp for them, but may be of very great benefit to them ; but they must be very careful to observe the prescribed rules, particularly, to drink little, slowly, and a little warm.

Some are of opinion that cold mineral waters agree best with men, and warm, best with the female sex, and this is neither without ground nor experience, for seeing the female sex is more phlegmatick, and less accustomed to cold drink than men, they generally speaking agree better with warm, and suffer by cold drink. From this we may conclude, that if the mineral water be a little warmed, it will agree as well with the female sex, as what is naturally warm, and they ought to take care to forbear drinking the waters 3 or 4 days during their *menfes* ; and such as are with child would do better to have a little patience, or if they cannot bear their indispositions so long as nine months, they ought to seek relief by other means, which will not occasion so great and frequent evacuations ; yet I have known some Ladies of a delicate constitution, that have drank the *Pymont* waters for some weeks after they were with child, and received no hurt, but brought forth strong and healthful children, nor have I

known any instance of miscarriage occasioned thereby; yet I have observed that most of them are troubled with nauseating and vomiting, and with some few, the waters have operated but slowly and with much trouble, as if nature did powerfully keep back and oppose such evacuations, wherefore in such circumstances, there is very little to be done with drinking the waters.

Women that give suck have frequently got great benefit by the waters, and sucking children have thereby been greatly relieved and happily cured; in the morning they ought to let the children suck them dry before they begin to drink the waters; and about ten when the waters have done working, they may let the children suck a little, or wait till noon. They must take care that every morning their bodies be kept open, and when the waters don't pass freely, they must take some gentle things to make them pass; for if this be not done, it brings a great purging upon the children, occasioned by the waters they suck along with the milk; and the milk is rather increased than diminished by them.

As to different constitutions, the waters agree best with *sanguine* and *choleric* persons, for they can bear drinking cold things, and the waters drank in small quantity work well and quickly with them, which is not so with *phlegmatick* and *melancholy* persons, for they must drink a greater quantity or forward the working by salts, and it is best for them to drink them lukewarm.

When people drink the waters in a regular manner, it seldom happens that any hurtful accident prevents their going on with the cure, but sometimes such circumstances happen which require particular consideration, viz. *Intire retention* of the waters, *vomiting*, *costiveness*, *want of appetite*,

tite, retention of urine, looseness, cholicks, soreness and heat in the intestinum rectum, itching and out-breakings over the whole Skin, unusual drowsiness, restless nights, giddiness and head aches, cramps in the calf of the leg and other members, smarting pains and return of old ailings.

The worst accident of all is the intire retention of the waters; It is not hurtful for the first and second day, providing they don't drink too much, neither is it a sign that the waters will be of no service to them. It is usual in this case to take a good purge to carry off the waters, and the following days to take a little of the water's own salt in the first glass in the morning, or some other opening and diuretick salt, and then usually every thing goes on well; But when the waters never pass without daily repeating these things, it is better to leave them off and seek relief by other medicines.

Vomiting frequently is of great service, for thereby the stomach is cleansed from all kind of filth, and commonly it continues but for 1, 2 or 3 days, if it continue longer and so hinder the waters from working otherways, it is best to stop it as much as possible, the patient must drink but slowly and little; the vomiting leaves off with some, as soon as they begin to drink the waters a little warm, and others sooner vomit with the warm than the cold water; when the vomiting proceeds from a cold and weak stomach they ought to make use of good *aromatick* and *bitter essences*, and they have best effect if taken at night before they go to sleep. *Costiveness* is frequently the greatest cause of nauseating and vomiting and of several other accidents during the cure, wherefore it is best to guard against it at first, which is best done by eating a good deal of soops, wholesome garden stuff,

stuff; some fruits, prunes, currants and such like, and when the waters are warmed, 12 glasses frequently purge more than 24 cold, also purging medicines prudently taken are very helpful, and salts have frequently very good effects this way, and indeed are the best both for gentleness and safety; *clysters* made of the mineral waters warmed, with other things belonging to them, are of great service, if the patient be used to them, and other circumstances allow of it.

Want of appetite seldom happens, seeing the waters frequently give a good stomach to such as have lost it; but when it happens, it usually proceeds from the body's not being open enough, and as soon as that is removed, the appetite returns; there are other causes of loss of appetite, which a good physician will easily judge of, and relieve by good stomachicks.

As to an *intire retention* of *urine*, hitherto I have seen no instance of it, altho' I have had several patients, both men and women under my care, who considering all circumstances had reason to believe, that they had great stones in their bladders. When it happens to any person, either from this or other causes, if other helps fail, they must make use of a catheter, or when the *ureters* are stopped, they must use gentle *diureticks*, *antispasmodica*, &c. *emollient clysters*. If there be any sharpness or burning in the urine, it generally proceeds from sand brought by it from the kidneys; or half cured gonorrheas, or when saline, bitter and sharp humours are carried off thereby, if this ailing should either be too violent, or continue too long, tho' it generally goes off in few days, it will be proper to take a good dose *expulvere temperante* or *fresh sweet oyl* when you go to bed, or in gonorrheas, to take the *specifica antivenerea*.
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When little of the water passes by urine but most of it by stool, and thereby a great looseness is like to ensue (tho' the *Pyrmont* waters by their rich ingredients use rather to stop than to relax too much) in that case it is best to drink very slowly, that the waters may have time to sink through the mesenterium, and commonly in this case strong *diuretick tinctures* and bitter *aromatick essences* are made use of, also when it is necessary, gently *retentive*, *quieting* and *balsamick pills* or *electuaries*, upon which the waters will operate as they ought; I have many examples of both men and women, who after too great intimacies with one another, have had great loosenesses, belly aches, and cholicks, and here *abstinence* is the best receipt.

Cholicks during the time of drinking the waters proceed, commonly from cooling the stomach and the bowels too much, wherefore they that are subject to them, ought to warm the water and drink it slowly and in small glasses. But when *Cholicks* arise from stopping of the body, then it is necessary to open it by relaxing medicines. And belly aches proceeding from flatus's must be removed by *carminative essences* and keeping the body open.

Soreness and *heat* of the *intestinum rectum* is ascribed by many to the sharpness of the waters, but if this were the cause, it would grow worse every day, whereas the waters themselves cure it in 3 or 4 days, but it is the sharp gall, which sticks here and there upon the guts, and which is mollified and carried off by the waters, which occasions this soreness and heat, if this continue too long and make the patient very uneasy the surest way is to wash himself with the mineral waters or to use the bath twice, and commonly after this it is gone in a few days, and in such a case

case anointing cum unguento *populeonis de linaria*, or with *oleo verbasci*, *hyperic* and the like, has good effect.

Itching and *Out-breakings* upon the skin, happen to them that have sharp and scorbutick blood, and is an excellent effect of the water, and never hurts any body but presently goes away, when the superfluous sharp humours are corrected and carried off, the use of the bath towards the end of the cure, clears the skin of all nastiness of this kind.

As to *Drowsiness*, it is very common to most patients, from several causes, viz. The sulphureous spirituousness of the waters, the early motion and exercise of the body in the morning, eating heartily at dinner, and sometimes drinking too much, and when the drowsiness is more than ordinary and altogether insupportable, it proceeds from thick slimy blood, unfit for motion, whereby the head and vessels of the brain are over-charged, and phlegmatick constitutions are most liable to this indisposition, but it goes off when the waters begin to work thoroughly, the body also may be freed of the load of such superfluous humours by the use of proper pills.

Waking and *restless nights* during the cure, do soon over fatigue the patient; sanguine, cholerick and melancholy persons are most subject to these, but it may be prevented by opening a vein and letting a sufficient quantity of blood; and at night before you go to bed, some good cooling, quieting soft medicines may be proper, but no opiates are to be taken, for they will hinder the waters from working.

Hot and dry constitutions are most subject to *giddiness* and *head aches* during the water cure, but they are commonly tolerable, or go off in a few days, and they may be removed the same way as restlessness; sus-

sufficient opening of the body, bathing the feet, and the like, are very serviceable in this case.

Cramps in the calf of the leg and other parts of the body is not an uncommon effect of the waters, for it passes through all the parts of the body; but these are seldom so strong but they may be born, and they may be eased or removed by rubbing the parts affected with *Anhalt water*, *spirit of wine and camphire*, *spiritu formicarum* and such like.

The returning of *old pains* in the solid parts, and breaking out of *old sores* are particularly to be remarked, and frequently happen during the cure, and tho' at first they portend a great deal of hurt and danger, yet daily experience teaches us that they not only are very supportable, but that a perfect and lasting cure does usually follow upon the same, and that usually the more uneasy the affected parts are, the more reason there is to expect sure help from the waters.

The remarkable *after-effects* of the mineral waters, of which so much has been said, both by ancient and modern physicians, are also confirmed to us by experience, viz. That patients, some weeks and months after they have done drinking the waters, reap the greatest benefit and help thereby; and are cured of *apoplexies*, *lameness*, *dimness* of sight, *deafness* and other distempers, sometimes by degrees, and sometimes all at once, contrary to all men's expectation. Much has been said concerning the causes of such *after-effects*; I account for them after the following manner. It is confessed that from the very beginning of our formation, (*ab ipso ovulo*) the *solid parts* were formed and put together out of the *fluids*, that afterwards, the solid parts are always affected by the fluids, and when these are any manner of way infected or spoiled, those by degrees suffer damage also; if the fluids are restored

to a good state, the solid parts, if their intire texture is not destroyed, or if not stuffed with matter that cannot be dissolved, are also brought into a better state, and as they are not liable to so sudden alterations as the fluids are, so they are last in receiving any help; they are not so soon hurt by inward causes as the fluids are, but when they are once weakned or hurt, it is longer before they are perfectly restored to their former function; when the mineral waters work, they penetrate through all the parts, press upon the weak and obstructed parts, and thereby cause an extension, and a very sensible pain and feeling of former ailings, and during the cure there is no appearance of help, yea rather matters grow worse; but when the mineral waters have fully and duly pass'd through all the *excretoria*, all the juices are by their excellent, cleansing and sweetening virtue brought into a good state; when nature has once received this assistance, and is delivered from the insupportable load of superfluous and hurtful humours, she becomes afterwards her own best physician, and by means of the good wholesome nutritive juices, she has recovered, repairs by degrees, as far as possible, what still was defective in the solid parts, when drinking the water was over.

And now I shall only recommend to such as love their health, that the surest way to partake of the great benefit and good effects that frequently follow after the course of drinking the waters is quite over, is, to abstain from all tedious courses of physick, and strictly to observe a regular dyet in all points, and the longer they do it so much the better, and in this way by God's blessing, to expect the after-effects of the waters.

C H A P. V.

Concerning Bathing with the Pyrmont waters.

SOME people foolishly imagine that cold *steel-waters* ought not to be warmed and made use of for bathings, seeing there are so many natural hot baths, which seem design'd by providence for that purpose, and are more proper and efficacious for removing distempers than cold waters warmed, but there is no more reason to think that we should make use of the means, which God has given us for the recovery of health, just in the manner as they come out of the Earth, without any preparation, than that we are to eat all our food raw and undressed; on the contrary, the right use of many of the best things we enjoy, seems to have been hid from man, till such time as he should by the right improvement of his understanding, and by careful observation and experience, find out in what way and manner such and such things might be made useful and beneficial to mankind.

With respect to *Bathing*, as there are many mineral waters, so hot that they cannot be used till they stand several hours to cool, and as reason teaches men not to use them as they come out of the spring, so it is with respect to cold waters, and as they generally agree both in their *original, ingredients, operation and effects*, it is reasonable to expect, that cold mineral waters, when warmed, should be as effectual for removing the indispositions of the human body, as naturally hot waters, and as the cold waters are commonly more
spirituous,

spirituous, and their ingredients more subtile, it is not without reason, that it is asserted, that when such fresh water is rightly prepared for bathing, it has better effect than a naturally warm bath, and particularly the *Pymont* waters, which may be warmed to a great degree for two hours, before the internal fermentation and motion of the subtile parts cease, and their spirits be intirely gone, for when this internal motion of the mineral spirit is in its greatest strength, it must necessarily affect and penetrate the solid parts of the body more strongly than a bare *saline water*, whose spirit and subtile parts have been already concentrated, changed and intirely lost in the *alkaline earth*, which gives us reason to think, that steel water baths are to be used more cautiously, and with greater circumspection than natural hot baths, because the first operate more strongly and are more penetrating than the last.

As to bathing with *Pymont* waters, we have so many instances of the wonderful effects of them in that way for almost these 200 years, that no other mineral water, hot or cold, can boast of the like, and it were easy to enumerate many of the various cures upon persons of all ranks, attested by physicians of the best characters, who were eye witnesses of the same, but seeing this would be too tedious, we choose rather to proceed to give an account of the best way and manner of preparing the bath, so as it may duly answer the end, also to mark out the several gross mistakes and abuses, that people fall into in this point.

The way and manner that the waters operate externally may be considered under two circumstances, *viz.*

1st, As long as the internal motion of the subtile parts of the waters continues and all their

their *spirituousness* is not exhaled and concenter'd into the *alkaline earth*, it strongly stimulates the extremities of the nerves, insinuates it self into the nervous and membranous parts, and contracts the external solid parts, strengthens and opens the nerves and restores to the relaxed fibres their natural tone, and all the *peccant matter*, which sticks in the external parts and their several canals is attenuated and partly carried off by sweating, partly carried back into the common mass of the humours, and afterwards cast out of the body by its several excretory ducts.

And when the membranous and muscular parts are too much moistned, mollified or extended, or filled with thick and viscous, or swelled with cold hydropical humours, they recover their strength and elasticity, and the swellings are intirely dispelled.

2dly, When the internal fermentation of the water is over, the spirituousness is gone, and the irony earth precipitated, then they operate much more gently, and come nearer to the nature of hot baths, they mollify more than they did before, and by the *balsamick, sulphureous ferruginous earth*, they strengthen the solid parts and cleanse the saline particles, insinuate themselves into them, but all this goes on more gently and slowly than before. The first way of operating is best for strong constitutions, and when one is sure that the body is freed by the internal use of the waters, from all superfluous and filthy humours, and that the *viscera* are sound and in good condition. To such, bathing affords frequently a very speedy relief against external accidents and defects, and does more in 5 or 6 times than other Baths in 20.

As for such as are of a tender and weak constitution, and who have reason to suspect that
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the *massa humorum* is any manner of way corrupted, or who have any swellings, the second mixture and state of the water is safest and best, at least it is fit to begin with it, and afterwards come to the other when matters are changed for the better, lest the superfluous and hurtful humours thrown back into the *viscera* and other parts, occasion *inflammations* and other disorders.

How this two fold state of the bath is regularly to be observed for the advantage of the patient, a skilful physician will be best able to judge and determine, according to the difference of constitutions and nature of distempers; and if the necessary rules be well observed, every body will find by experience, and by manifold instances of cures that happen every year, that the *Pyrmont* water when warmed is effectual in all diseases wherein hot mineral baths have been found to give relief.

We shall now consider, 1st, The necessary preparation for bathing.

2^{dly}, The time, when.

3^{dly}, How long it is fit to continue it.

4^{thly}, The way of preparing the waters.

5^{thly}, How long it is fit to stay in the bath, with the other rules necessary to be observed, in and after the bath.

1st, The best preparation for bathing is, using the waters internally, for thereby the body will be so well cleansed, that there will be no reason to fear that the superfluous humours will be heated by bathing and brought to ferment, or any hurtful thing driven from the outward parts into the *viscera*, as has been already said.

But if for any particular reasons, bathing without previously drinking, the water, is found to be most proper, then the body must be first cleansed by proper medicines, and during the course

course of bathing, dayly kept open; and such as abound in blood may open a vein some days before they begin.

2dly, As to the time the following rules must be observed.

1st, The best time of the year is the hot season, when the weather is good, and there is the least reason to be afraid of catching cold, and thereby shutting the pores of the body.

2dly, After the Patient has drank the waters 8, 10, 12 or 14 days, and finds his body eased and cleansed thereby, then it is proper to begin bathing, and it is not necessary to fix particularly upon a determined time for continuing the bath, as some imagine, for many drink the waters warmed in the morning, and afterwards bath in them, and go on for 2, 3, 4, weeks, and sometimes twice a day, without any inconveniency, and the experience of many years shews us, that the internal and external use of the waters at the same time are very consistent, when due care is taken, to use them in a regular moderate manner, and indeed drinking the water moderately, during the course of bathing, is among other things of great use to prevent *costiveness*, which such as use the bath are very liable to, and thereby several indispositions are occasioned, which may indeed be helped by relaxing medicines, but by none better than by the water it self.

3dly, It is necessary that they who use the waters both internally and externally at the same time, should set apart more time for that purpose than two or three weeks, that so the cure may not be over hasten'd, but proceed gently with all due precaution; neither is it improper to prolong the bathing eight days after having done drinking,

and sometimes it may be proper not to begin bathing till drinking the waters is intirely over, but all this must be suited to the circumstances of the patient.

4thly, The time of the day most proper for bathing is nine a clock in the morning, and five in the afternoon, when digestion is over.

5thly, Such as are fat, and abound in blood, agree best with bathing in the morning, when their body is alert, and their Vessels not so full, as they usually are after eating plentifully, when a great quantity of chyle is dispensed to the blood; but upon trial every one will find what is most suitable to his constitution.

6thly, Such as cannot stay at home, but are obliged to be abroad about noon, and to expose themselves to the open air; when the weather is but indifferent, and such who after bathing lose their appetite, or are much inclined to sleep, and find themselves fatigued, will do best to bath in the Evening.

7thly, The patients themselves will be able to judge how often, and how long they ought to use the bath, by observing how they bear it, if they are not over fatigued by it, and if their Limbs are easier after it, &c. but especially a skilful physician, to whose direction they commit themselves, will be best able to judge, by considering the nature of their distemper; after the same manner it may be determined, whether it be best to bath every day, or every other day, or two days successively, and intermit the third day; there are many instances of patients that have bathed 10 or 12 times successively, not only without any inconveniency, but with very good effect; but
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this depends intirely upon the strength of the patient.

The Waters for bathing have hitherto been taken out of what they call the *Brodel Well*, not that the water of what they call the *Trinck Well* is not as good for that purpose, but because it being used for drinking, might be troubled by drawing a great quantity for bathing also, and tho' the water of the *Brodel Well* be not so subtile, spirituous and clear as the other, and tho' all waters lose a part of their spirituousness when warmed for bathing, yet the remaining contents, which suffer no alteration by being warmed, are in greater quantity in these, than in the waters of the *Trinck Well*. The usual way at present of preparing the waters for the bath is to warm a certain quantity of them, and to mix it with a greater quantity of the cold fresh water in the bathing tub, which seems not to be amiss, for thereby the spirituousness of the fresh cold waters keep them a considerable while in full motion, and fermentation, which produces the effects we have already mentioned; but when the bath is prepared for persons of weak constitutions, it is best to warm the whole quantity upon a gentle fire, that so the waters may lose some part of their spirituousness and strong penetrating virtue, which otherwise would be too strong for some constitutions and diseases, as we have said before.

When the waters for bathing are prepared either the one or the other way, these following rules must be observed in the use of them.

1st, That they be only milk warm, or not warmer than our blood.

2dly, After putting on a bathing shirt, prepar'd for that purpose, if the patient be strong, he may presently sit down upon the cushion, which is placed in the bath, and is made of linnen-cloth wrapped up and folded together; but such as are of a weakly constitution, and know by experience that they are strongly moved and affected by the bath, ought at first to put only their feet into it for a few minutes, and then to go up to the knees, and afterwards sit down upon the cushion.

3dly, After the patient is set down upon the cushion, he must be well covered with cloth, all except the head, and the parts above the water will by the steam of the warm water be soon put into a gentle sweat. It has been usual not to go deeper into the bath than the navel, as if the water were too strong and penetrating for one to go into it above the stomach; but if the condition of the patient will allow it, when the waters are duly warmed, and there be sufficient room in the bathing place, he may go into it even over the shoulders, as well as in other mineral waters; but if the patient cannot bear it, and yet the uppermost parts require the assistance of the waters, in that case they may either be poured upon the parts, or with a sponge or wet cloth applied to them.

4thly, If the patient find that his body is not warmed sufficiently by the waters, and that he can bear them if they were warmer, then it is fit to pour in more warm water, till such time as he find it is enough, and that a gentle sweat begins to break out; and indeed it is much better that the bathing should occasion a gentle sweat, for thereby a great deal of hurtful stuff is thrown
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out of the body, and by opening the pores, the mineral virtue of the waters can better insinuate itself into them, yet it is better not to sweat at all, than to force it by too hot a bath, for we have many instances of the good effects of bathing without sweating, and to supply the place of it, rubbing the body with a coarse rough cloth will have good effect, and this has been much recommended by ancient physicians, as very effectual in external disorders, for the quickening the nerves, recovering the tone of the parts, and opening the pores, &c. The dropping of water from a high place upon the affected parts is now seldom used ; but such a thing might easily be contrived during the course of bathing, and to very good purpose.

5thly, The patient ought not to stay in the bath the first time above half an hour, afterwards by degrees three quarters of an hour, one hour, an hour and a half, but never above two hours, to sit longer in it is neither necessary nor useful.

6thly, If the patient finds that he turns giddy and faint, and has a strong palpitation of the heart, he must not wait till he faint away, but must come out and go to bed, and bring himself by degrees to bear the bath, and such as are affected in this manner by it, ought to have good volatile salt to smell to, or some other thing to revive and strengthen them, if needful, that they may be able to hold out.

7thly, When the patient come out of the bath, he must take care to keep himself warm, dry and shift himself by the fire, and then go into a warm bed, and let the sweat go off by degrees.

8thly, It is very seldom found to be of any advantage to take a *sudorifick* before or after bathing, for commonly the patient in time of bathing sweats more than is needful, and they that are hard to sweat can scarcely bear any hot *sudorifick*; but such as are subject to ebullition of the blood, palpitation of the heart, giddiness, &c. will find great advantage by taking a good dose *ex pulvere temperante, cooling salts, or the like*, in two spoonfuls of wine, a quarter, or half an hour before they go into the bath, for many who have been thus affected, have by so doing, been perfectly relieved, and sometimes persons have by these things been brought to sweat enough, who could not by the strongest tinctures of bezoar be disposed to it.

9thly, If the patient stay in the bath from 9 to 10, and in bed from 10 to 11, he will have at least an hour to refresh himself by degrees before dinner, and a glass of wine with a good stomachic will not be amiss, and it will be best to dine at home, and not go to the open air till after dinner; in the evening it is best to eat something hot after bathing, and to stay at home and walk in a night gown, and to pass the time in agreeable company, for it is not good to lie long in bed after bathing, because commonly ebullition of the blood and restless nights are the consequents of it.

As to other things that relate to dyet and the way of living during the course of bathing, the same rules ought to be observed as in drinking the waters; and as to any other method of using the waters externally by fomentations, anointing, washing, gargling, &c. a skillful physician acquainted with the properties and virtue of the waters will be best able to direct, according to the
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nature of the distemper, and experience will shew, that whatever may be hoped from a good mineral water, may be equally found in this; as to what effects bathing in the cold mineral water would have, we shall leave it to further experience and tryal to find it out.

C H A P. VI.

Concerning the abuses and mistakes that Patients fall into while they use the waters, whereby they may become dangerous and hurtful.

WE have already observed that all the means God has been pleased to bestow upon us, both for nourishment and health, when not rightly used, become unwholesome and hurtful; and as there is no medicine that can cure all diseases, so it is no wonder, that by the use of the best mineral waters all sick people are not only not cured, but even some receive hurt by them, and as it is manifest, that every year, many diseases reckoned incurable, all other medicines having failed, have been cured by the *Pymont* waters, yet it is owing to a disorderly way of living during the cure that many more are not cured; wherefore to conclude this description, we shall briefly mention some of the abuses and mistakes that patients commit during both the internal and external use of the waters. And first drinking the waters cold without any order or discretion, is the occasion of the greatest mischief, of which we have many instances, some drink great glasses full without any intermission, and if they can but

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swallow

swallow the quantity they propose to drink they think no more of it ; but it is easy to consider that few patients have so much internal heat, as is sufficient to warm 6 or 8 pounds of cold water, which perhaps they drink in the space of one hour, or an hour and a half at most, without receiving some damage by it.

Every body knows that the several fluids of the body are preserved in their fluidity by motion and heat, and that they are coagulated by cold and rendered unfit for motion ; now seeing our life consists in the free motion and circulation of the fluids through all the parts, even the smallest vessels of the body, whatever disturbs this motion, or coagulates the fluids, particularly in the *viscera* must be prejudicial to health ; so that it is evident when the stomach is filled all of a sudden with exceeding cold water, neither it's own heat nor that of the contiguous parts is sufficient to warm it so soon as is necessary, so that the several parts not accustomed to the cold must be thereby contracted and their fluids thickned, and if the coldness of the water have this effect upon the parts that are sound, what effect must it have upon such as are weakned and stuffed with thick and viscous humours ? certainly these obstructions must be thereby increased, hardned and made altogether indissoluble.

It is wholly owing to this disorderly use of the waters that patients so often complain that the waters were too strong for them and have spoiled their stomachs, brought an ague upon them, weakned their breast, given them a cough, &c. all which is owing to themselves and not to the waters, and they are very happy that have escaped so well ; for according to the way of living

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now a days few persons are accustomed to cold things, and among a hundred persons of distinction scarce one is accustomed to drink cold liquors in the morning; coffee, tea, chocolate being their ordinary drink, so that such a quantity of cold water taken all at once cannot but be very prejudicial to them. And tho' the cold mineral waters are not so frequently hurtful as common water, because the mineral spirit and the internal motion and fermentation of their subtile parts, and their opening and dissolving qualities give them some small degree of heat, yet it is with them as with wine, which notwithstanding of the hot spirit contained in it, when drank very cold, stops the circulation in some or other of the *viscera*, and has all the bad effects of any other cold liquor imprudently drank, and in the manner we have said, affects even hot and vigorous constitutions, but especially such as are cold, phlegmatick and weakly through various obstructions and unwholesome humours.

If it be objected to what has been said, that many physicians are of opinion, that cold water sometimes strengthens the stomach, restores the *tone* of it, when too much relaxed, and the nerves and other vessels to their former elasticity; it may be answered, that this is not denied, and a small quantity of cold water which the stomach may easily warm cannot hurt any person, but a great quantity drank without any discretion, and for many mornings successively, cannot but be very dangerous and hurtful.

And here it will not be amiss to warn the *female* sex, that if during their *menfes* they continue to drink the cold waters, they put their health to the tryal, and in very great danger, and it is a great pity,

pity, that the waters which every year restore so many women to their health in this article, should by imprudent management prove the ruin of others.

2dly, Another mistake and disorder that patients are guilty of is, when they drink the waters in too great quantity, and too fast, and this is very common, for when the waters don't follow their caprice and operate according to their fancy, then they must take the other full bumper, and as they talk make one bumper drive out another; but how strong and hot soever their constitutions may be, yet all the inconveniencies already mentioned, that are occasion'd by cooling the *viscera* too much, will also follow upon this method. For such patients as are in too great haste and have their minds hurried and distracted with business, which they seem to mind more than their health, and when perhaps as many weeks as they reckon days are necessary for the cure of their disorders, would do much better to abstain intirely and so prevent the hurt they may sustain by not observing such method and rules as are absolutely necessary.

3dly, The most common disorder and abuse of all is in the *dyet*, how much hurt is done by eating all kind of *sugar cakes, prunes, raisins, &c?* whereby the waters are not only hindred to operate freely, but they breed sharp, sower viscus humours in the stomach and bowels, which tho' they may be some times presently carried off by the waters, yet it were much better not to put such a hindrance in their way, for there remains always something behind that disturbs the digestion and occasions other disorders; and immoderate smoaking of tobacco is much more hurtful than useful, and it rather disturbs than promotes the natural operation

operation of the waters, especially considering that the lovers of it can never keep within bounds.

4^{thly}, Eating too soon after drinking the waters before the *primæ viæ* are for the most part freed of it, is also a very great fault, for the victuals are carried off too soon by the waters which remain, and undigested juices carryed into the bowels, &c. which occasion cholicks, obstructions of the glands, &c. The waters give the patients a good stomach, so that they both eat too fast and too much, especially at night, and with all kind of fruits and other things they frequently bring upon themselves all sorts of disorders and intirely defeat the good effects of the waters.

5^{thly}, patients are frequently very disorderly in their ordinary drink, some as soon as they have done drinking the waters drink a great deal of coffee, tea or chocolate, and thereby disturb the operation, and drown the bowels with too much moisture, so that what the mineral water has, by it's spirituousness and subtile irony earth in some measure strengthened, is either relaxed anew, or the good effects, in a great measure prevented; if the design be to warm the cold water, it would have been better to have warmed it a little before drinking it, than to do it with other warm water, after the cold has had it's bad effect upon the viscera, and the mineral waters are thereby too much diluted and weakned.

6^{thly}, They that drink too much wine during the course of drinking the waters, do great hurt to their healths, as we have already observed. Patients are generally of opinion that they ought to drink plentifully of wine in order to fortify their stomach, and they that love it comply very cheerfully with this rule, and if before they begin
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to use the waters, their physicians did either forbid it altogether, or restrained them with respect to the quantity, yet then they think themselves at full liberty; and when their distempers proceed mostly from the immoderate use of hot liquors, their heated, dried, and sharp bilious blood wants to be diluted, cooled, rectified, and cleansed, yet they returning to their former disorders, by which they brought their distempers upon themselves, not only make the best means for recovering their health ineffectual, but frequently reduce themselves to a worse state than before.

7thly, Sleeping long at noon is also very dangerous during the cure, and sometimes causes convulsions, apoplexies and the like; for the waters by their *spirituousness and subtile sulphureous fat* affecting the head, may during the sleep raise a confused motion in the nerves and other small vessels of the brain, especially in *fat sanguine people*, who are naturally disposed to such distempers; moreover sleeping long after dinner is the cause of indigestion, bad chyle, pains in the stomach, weariness and laziness, wherefore it is best to avoid it as much as possible; gaming after dinner is as hurtful as sleeping, because the patient must sit still and think closely.

8thly, It is well known that all commotions and disturbances of the mind, such as, *anger, fear, sorrow* and the like, are very hurtful to people in good health, but more especially to such as are weak and sickly, particularly when under cure, for then all the humours are in a kind of fermentation, so that it cannot be easily imagined how destructive to the health such like passions are; we have already proposed what is to be done to avoid them.

Exercise

Exercise of the body is very beneficial to such as drink the waters, providing it be moderate, but when it exceeds the due bounds, it occasions immoderate sweating, which hinders the waters to produce their best and most beneficial effect, and is the cause of many disorders, as has been already more fully explained; and this is a point wherein many ladies of a tender and weakly constitution do great prejudice to their health, for their heart being set upon balls, they frequently repeat and continue their dancing so long till they over heat themselves, grow faint and thirsty, and then they have their recourse to confections, coffee, tea, limonade, wine &c. which greatly overcharge and disorder the stomach, and next morning they are very unfit for drinking the waters, so that they are not only not cured of their present distempers, but fall into new disorders, which naturally follow upon being over heated, with too violent exercises, and then catching cold.

As to abuses and mistakes committed in bathing, it is *first* to be observ'd, that as in the internal use of the waters, drinking them cold without any thought or consideration, does the greatest mischief, so, on the contrary, in the external use of them, making the bath too hot does very great harm; for the women employed for preparing the bath, and even the patients themselves are of opinion that it can be of no service, if they don't sweat plentifully over all parts of the body, so that they make the bath as hot as it is possible to bear it, and commonly the patients come out of it as red as boiled Lobsters, and from thence arise great and many disorders, such as *loss of a great deal of the useful moisture of the body, great thirst, strong ebullition of the blood,*
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head-aches, giddiness, palpitation of the heart, asthma's, weariness, faintness, restlessness, loss of appetite, fevers, &c. so that all the medicinal qualities of this strong mineral water which we have already mention'd, don't make so great alterations in the body, as the accidental property of superfluous, unnecessary and hurtful heat usually makes, which it is in the power of every body to moderate as they please, and as may be most for their advantage.

It is very common when any patient suffers these inconveniencies which are the certain consequences of bathing in too hot water, to ascribe them to the water itself, as if it were too strong, and unfit to bath in, yet it is known that persons of a very weak and tender constitution, when the bath was prepared as it ought to be, have not only used it for a long time, but frequently can stay two hours in it without the least inconvenience.

Bathing is hurtful in long *Paroxysms*, and violent fits of the palsy, such like diseases have commonly their periods and changes, they are gone for some time, and return afterwards at a certain time of the year, if one use the bath at such time, his members cannot endure such strong irritation and moistening, so that his disorder becomes worse, and it is long before he can be brought to rights again, but when it is done at a proper time, the patient will thereby prevent the paroxysm, preserve himself the whole year, and if the distemper be not too much rooted, be at length intirely delivered from it.

If any body undertake to dissipate and dispel too soon any great swelling in the feet by the use of the bath, it is commonly the cause of many
inward

inward disorders, so that any thing of this nature must be done by degrees, and with great precaution; neither ought any person to use bathing for curing of *ulcers* or *old sores* in foul unwholesome bodies, till such time as the *superfluous*, *sharp bilious* humours be carried off, and indeed in all distempers, till the body be cleansed, the bath cannot be used without danger and hurt, as we have already shewn in the preceding chapter.

Lastly, 'tis a great abuse when decrepit old people that have no more strength nor moisture, that are consumed by long hectic fevers and inward distempers, or other sick people that can receive no further help from any other medicine, but are already compleat *candidates for death*, come to the waters as if it were to the *tree of life*, and make use of them as their last refuge, for they would do much better to wait for their last hour with patience, than thus to hasten their end, and bring a bad report upon the waters that in themselves are altogether harmless.

If these abuses which we have mentioned be carefully guarded against, the chief objections against the waters will fall to the ground, and we beg leave to ask such physicians, as lightly esteem mineral waters, these following questions;

In what way and manner do they cure their patients? Is it by evacuations? We have shewn that the *Pyrmont* waters cleanse and clear the body through all excretory ducts whatsoever, and that in a safe and gentle manner.

2dly, Is it by removing obstructions? then the ingredients of the waters are among the best aperients.

3dly,

3^{dly}, Is it by restoring strength to the benumbed and relaxed parts? then the rich chalibeat waters produce this effect best.

4^{thly}, Is it by sweetening and correcting the sharp, fowr, saline, and bilious humours? this is done by the alkaline earth and crySTALLINE substance contained in the waters.

Now when any medicine produces all these capital effects, if something particular against most distempers incident to human bodies is not to be expected from it, I know not where any thing better is to be found.

F I N I S.



A BRIEF

ACCOUNT

OF THE

Mineral Waters

OF

S P A.

Extracted from several Authors.

By GEORGE TURNER, M. D.



L O N D O N:

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CHAP. I.

A Description of the Town of Spa.



PA is a town situated in the district of *Liege*, six leagues east from that capital: it was formerly a small village, but has since been enlarged to a town by the inhabitants, who found themselves obliged to increase the buildings for the conveniency of lodging the great number of strangers who resort thither for the benefit of the waters.

Most of the Houses are built in the form of a crescent, the outside middle facing the south, having a view of the east and west; and the whole town is shelter'd from the north by a high mountain that extends itself more than the length of the whole town.

The country around is for the most part heath, woods, and mountains, abounding with springs both of mineral and common water, which descends in rivulets, and waters the meadows and cultivated grounds, which produce no wheat, but instead thereof a great quantity of spelt and oats, and some rye, but so little, that the greatest part of their bread is made of spelt which the inhabitants find both savoury and wholesome; there is likewise some flax for their own use, which thrives very well.

The rest of the country is stony, and full of barren mountains, yielding little else than heath and wood, which affords but a wild prospect; so that those who come to *Spa* for a remedy for their diseases must not expect to find a fine champaign country, with the fruits and flowers of *Italy*; yet those who delight in hunting and shooting will find a country full of game, such as wild boars, deer, and hares; heath cocks, gelinots and partridges; besides other birds of the common sort.

There are medicinal herbs to be found upon the most barren mountains, and likewise wild thyme, which is an excellent feeding for sheep, and is the reason for the mutton of this country (tho' small) being preferable to most that's to be found elsewhere, and the rivulets that descend from the mountains are full of Trouts, Gudgeons, Loaches, Crawfish, &c. which makes them be sold very cheap.

The inhabitants are so dexterous both at hunting and fishing, that was it not for the diligence of officers that are employed to restrain them, the game would be intirely destroyed in a little time.

S E C T. I.

*Of the accommodations that strangers meet with at
SPA.*

Strangers who have been once at *Spa*, are generally desirous of going thither again; for besides their finding a remedy for many obstinate distempers which all other means are often incapable to overcome; they have the pleasure of being well received by the inhabitants of *Spa*, and those of the neighbourhood, who are very courteous and obliging to strangers, behaving towards them with
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the utmost respect. The country people bring great quantities of all sorts of provision every day without exception, and sold at a very reasonable rate, there is good bread and wine of all sorts, and even cheaper than at *Liege*, besides other useful *liquors* such as Coffee, Tea, and Chocolate, likewise their beer is very good.

There are convenient lodgings for all sorts of people, and even *sovereign princes* would not be at a loss for reasonable accommodations.

They who chuse to have their victuals dress'd at home, may have it done very conveniently, for wherever you take a lodging the people of the house are obliged to furnish you with firing, and all the necessary utensils for cookery, or you may be served from the cooks or taverns at a very reasonable price.

The great concourse of strangers encourages the merchants of several towns to bring their goods to *Spa*, as to a good market, where all sorts of useful and curious things are to be sold; and the inhabitants make several little trinkets of wood, ivory, mother of pearl, tortoiseshell, silver, and brass, and have a particular knack at inlaying, representing the figures of men, beasts, birds, fishes, insects, fruits, flowers, leaves, &c. Most people purchase some of them, being so exceeding curious as hardly to be equall'd in other countries; and their quick vent obliges the artificers to confine themselves mostly to this sort of work.

As to the conversation of the place, people generally associate together without distinction, and those who are strangers to one another soon become acquainted, and carry on their little amusements, and diversions with the utmost freedom; balls and assemblies are open to all who make a tolerable appearance. Laymen may say and do

what they please, provided it be without offence to God, or scandal to their neighbour ; ecclesiasticks may speak their thoughts, tho' with some caution, and a decency fuitable to their profession, and they are generally of the party in most polite conversations.

Every thing tends to amusement, wits exercise their satyr, and raillery, and are sometimes paid back in their own coin ; nothing is serious, but gaiety and innocent diversions seem (next the use of the waters) to be the business of the place.

As people from most parts of *Europe* come to *Spa*, so every one that pleases may associate with those of his own country ; if it sometimes happens otherwise, and that a person is at a loss for want of acquaintance, every one is officious to engage and introduce him into whatever company suits with his temper ; you converse freely with those you like, and avoid those you don't, without offence. They who are of a melancholly disposition may indulge it on the wild heaths, or solitary woods, which this country will sufficiently furnish them with.

Those who are lovers of the stories of *faries*, and *Hobgoblins*, will be entertained that way by the old inhabitants, who by the salubrious quality of the waters are healthier, more fertile in generation, less subject to epidemical diseases, and attain to greater ages than those of most other countries : the reason of which *Stephins* gives us in his medicinal art, where, speaking of the people of *Spa*, he says, “ The solidity which their bodies acquire by the use of fossils, to wit, metals and minerals, and the daily discharge of the excrements by all the passages, is the cause of their being less subject to early decays, are of long life, and exempt from epidemical diseases.

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In order to prevent quarrels the magistrates forbid the wearing of swords, or any other offensive weapon than a slender stick wrought at *Spa*, which is either used for ease in walking or purely for fashion's sake, for whenever any dispute arises it seldom goes farther than words, every one interposing and endeavouring to prevent any ill consequence that might happen.

There are *necessary houses* built near the several wells for the conveniency of those whose waters pass by stool, that they may not be obliged to go too far off, which might fatigue and heat them, and divert the operation of the waters; they who are not able or inclinable to go far for a walk may find a delightful one at hand in the *Capuchin's garden* which is always open, and in case they have occasion there are necessary houses apart for both sexes.

In a word, the pleasure and satisfaction that most people find at *Spa*, is the reason that not only the *Valetudinarians*, but people in good health often come thither, for the agreeable passing away of a summer: others come by way of prevention to preserve themselves against some distempers that at certain seasons they are *subject to*. The only and great inconveniency that the * *Bobelins* have hitherto found, was the badness of the ways from the town to the wells of *Geronster* and *Sauvenerie*, but the *Count D'Aspremont* has lately been pleased to remedy that evil, so that for the future none will have reason to complain.

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S E C T.

* A name given to the water drinkers.

S E C T. II.

Of the situation of the several Wells of Spa.

The wells of *Spa* are principally five, tho' there are several small springs that discover themselves in the neighbourhood, but not worth further notice. These five are *Pouxbon*, *Geronster*, *Sauveniere*, *Watroz*, and *Tonnelet*, the three first are most in use, tho' the other two are sometimes prescribed by physicians.

Pouxbon is in a little bottom at the lower end of the market place, and stands in a fine niche of free stone, shut in with a door facing the west, it's spring comes from a hill about a musket shot north of it, which faces the south and has likewise a view of the east and west, so that it is exposed to the whole heat of the sun. Between the said hill and *Pouxbon*, there is no fresh water, 'tis all mineral, which is a confirmation that it has it's source from thence. A few paces distant from *Pouxbon*, in the market place towards the east, stands a fine fountain of fresh water, (surrounded with an iron rail) to which there are four entrances, ascending two or three paces you come to the water that runs into four vases of free stone, that receives each a pipe from another placed above the middle of them, which receives likewise three other pipes issuing out of the mouths of three brazen Frogs, that carry upon their backs a step, which is the arms of *Liege*.

Upon observing the situation of this fountain, one would immediately imagine that its water came from the same hill as that of *Pouxbon*, but it does not, but from a field about a quarter of a league

league distant called *Bosset prez*, and conveyed from thence by pipes.

The company meets every morning early at *Pouxhon*, even those who drink the waters of *Geronster*, and *Sauveniere*, so that it may properly be called the *general rendezvous of Spa*.

The well of *Geronster* is distant three quarters of a league south west from *Spa*. It stands in the hollow of a rock, under a cupula of free stone supported by four marble pillars that were erected by order of *M. Conrard Bourgsdorf*, *Counsellor of state to the Elector of Brandenburg* in the year 1651; you go down three steps to the well which is encompassed with a wall. It is considerably less than that of *Pouxhon*.

Thirty or forty paces from hence is to be seen the remains of another well formerly much frequented, called *old Geronster*. Being obliged to dig in this place for water to supply the crowds of people that flock'd thither, some stones of the rock were shaken which diverted the course of the water, so that nothing now remains but mud of the colour of rusty iron.

Sauveniere is half a league south east from *Spa*, its spring comes from a rock lying south of it. It is surrounded with a wall which is covered with a cupula of free stone, 'it is very neat but much less than *Pouxhon* or *Geronster*, so that it often happens when there is a crowd of people it is emptied so fast that they are oblig'd to drink moderately, and in proportion as the water comes out of the rock.

Behind this well and in the compass of it's wall there is another spring which from it's vicinity is called little *Sauveniere*, or *Grosbeeck*, from the *Baron* of that name, *Archdeacon of Condroz* and *Chancellor*
to

to his serene highness the *Bishop* and *Prince of Liege*, who adorn'd it with a niche of free stone in the year 1651.

These three wells are the most frequented ; they have each of them a shelter from the inclemency of the weather ; that of the market place is very neat, that of *Geronster* is a shed made of four rough walls cover'd with straw, that of *Sauveniere* is somewhat larger, and cover'd with black slate, but the walls are of the same materials as that of *Geronster*, but whitened on the inside. At each place there are persons appointed to make fires every morning before the company comes to drink the waters.

The Burgomasters of *Spa* might make these two last places more convenient, tho' indeed they have no great encouragement to attempt it, for as they lye so remote from the town, as soon as any little accommodation has been made, some idle people have put it out of order.

These wells being situated in rocks, can receive no alteration from the rains, (tho' 'tis vulgarly believed they do) besides, *Geronster* and *Sauveniere* are shelter'd from them, and *Pouxhon* can only suffer when the channel that runs through the middle of the town is overflow'd above the level of the well ; nevertheless tho' it is certain that in rainy weather the waters are weaker, and their vertues are diminished, yet it is as certain that they are not less so in cloudy weather when it does not rain : so that it is not the rain, but more likely the temperature of the air, which at those times deprives the waters of their ordinary activity.

Coming down from *Sauveniere* a quarter of a league north east from thence, and half a league from *Spa*, is the well of *Watroz* ; it stands in the
lower

lower end of a marshy field, whose soil is no better than a quagmire, it's spring comes from a hill about a musket shot distant, it is inclosed with a little wall almost ruin'd and surrounded with rough stones laid one upon another, with a large one at the top to serve for a covering; there is no place for shelter, and it's situation is so bad and it's water so sensible of an alteration by rain and damp weather, that it is not advisable at those times to make use of it.

Tonnelet is a little farther distant on the ascent of a hill, in a large field call'd *Fresneuse*, half a quarter of a league from the rocks. It has no retreat nor shelter nigher than a neighbouring village call'd *Nifzez*. This field, particularly near the well, is so boggy and spongy, that in several places it appears dangerous for any one to venture for fear of being buried alive. Its lying so remote from the mountains, and situated in a marshy ground, are reasons for this water receiving an alteration from the least change of weather.

It's spring is incomparably greater than the others, the water gushing up in great quantity into a barrel without a bottom thrust into the earth, from which it has it's name. The water is so intently cold that one could more easily endure putting one's hand into snow or amongst beaten ice than into this well. It stands in a niche, formerly neat enough, but through neglect in letting it go to decay, it is now almost ruin'd. It's water is strong of the mineral, and tho' some physicians prescribe it, yet it is not in much repute.

Of these five wells that of *Pouxbon* has most of the fun, which, with the subterraneous heat, does not a little contribute to a perfect mixture of the minerals with it's water.

CHAP. II.

*The analysis of these several Fountains, by
Mr. Chrouet, M. D.*

I Begun, *says he*, with that *rubrick* or *red earth* which is found fixed to the pavement of the wells, or in those channels through which the waters run; that which I found most worthy of observation was that this earth seem'd to contain the minute particles of whatever substances enter'd their composition, and that because they are not separated by putrifaction or corruption, but by their proper weight and by the dissipation of those spirits that sustain them. This is so true that if a glass of this water issuing from the fountain is exposed to the air, one sees some moments after, little bodies of a redish colour floating therein, which all come from the surface of the water, and increase in number proportionably to the dissipation of it's spirits, and at last subside at the bottom under the form of red earth; the bottles kept for that use being a convincing proof.

Those who judge of it by it's look, take it to be a kind of *iron rust*, but it's levity and unctuousity which it leaves on the fingers upon touching it contradicts this opinion, moreover the four or five fountains which I examined with the utmost care resemble one another but very little, for that of *Tonnelet* is of a lively red colour, and tastes sweet as sugar, that of *Pouxbon* is yellow, and piquant to the taste, that of *Sauveniere* is of the same colour, but like that of *Tonnelet* in sweetness; and that of *Geronster* is also yellow but of a saltish taste.

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After these small proofs I undertook to make an analysis in all the forms. I boil'd five ounces of that of *Geronster* in eight pounds of rain water, and after letting it clarify I filter'd it through brown paper, and by evaporation on a slow fire, got two scruples of a bitter and piquant salt which would neither ferment with acids nor *alkalies*, it chang'd the decoction of galls to a whitish colour, which precipitated to the bottom of the glass like curdled milk, and left the liquor above of a yellow colour. This salt being pounded with charcole, and put upon a tile, only redden'd in the fire but made no detonation, and being calcin'd it became immediately *alkalous* without any puffing up, from whence I infer that it was neither *vitriolous*, *nitrous*, nor *aluminous*, but a *double salt* resembling the vegetable salt of plants which, like that, easily loses its acid and becomes *alkalous* by the least heat, contrary to the nature of those salts which are only subject to this alteration from the last degree of fire.

Having examin'd this salt I was desirous of being satisfied, if it contain'd any sulphur, I therefore put twelve drachms of this matter into a crucible which immediately sent forth a smoke that smell'd of burnt iron and sparkl'd a little, from whence I imagin'd there was sulphur; I pounded some of it with salt-petre to see if putting that into a crucible it would crackle, which not happening made me conclude that these fumes and sparklings were not caused by a common sulphur, but rather by particles of a metalick sulphur, which was to be discover'd in another manner.

I boiled twelve drachms of the same rubrick in a moderate quantity of rain water with double it's weight of salt of tartar till the water became red, which I repeated by adding still the same salt till
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it would take no more tincture, then all the sulphur being enter'd into the pores of the salt of tartar, I precipitated it by pouring upon the tincture an equal quantity of well filter'd lime water, the mixture immediately thicken'd and became white as milk, but insensibly subsided in the form of *whitish sulphur*, which I took care to wash and dry very well, then setting it upon the fire it smoaked considerably and made a little noise with nitre, retaining nevertheless the smell of iron, which confirm'd me that it was a real metalick sulphur, some particles of which had been exalted by the fiery corpuscles of the lime, but so elaborated with its double salt, that it wanted nothing but to be interwoven with a necessary quantity of earth to make it real iron.

The twelve drachms that I put into a crucible to be examin'd by fire, lost a sixth part of its weight, and took a dark colour; I threw half a drachm of it into an ounce of the decoction of galls which immediately chang'd its colour to a beautiful black; I likewise took another drachm and held it near a loadstone which attracted with a surprising swiftness every particle of it; this made it appear to be the real substance of iron without any mixture of other metals as *led*, *copper*, *cerus*, &c. nevertheless if it be exposed to the fire above half an hour it becomes as red as vermilion and loses its quality of being attracted by the loadstone and tinging black, but this happens likewise to the filings of steel when they are too much calcin'd by a brisk fire. Thus judging of the virtues of the water from which this red earth of *mars* and *metalick sulphur* is taken, they ought to be greater than those from iron it self, because this valuable sulphur with the double salt enters directly into the
mass

mass of blood and enlivens it, whilst the metallic part going no farther than the *prima via*, corrects the too acrid juices, and strengthens the bowels, and this it does more effectually by being more exquisitely divided by nature than it could be by art, so that the whole fibres of the intestines are sensible of it's effects.

Five ounces of the rubrick of *Tonnelet* managed in the aforesaid manner yielded me only ten grains of a salt fat, and eager like *cream of tartar*, but after having made the same rubrick hot by the fire I extracted half a drachm more from it, it precipitated the decoction of galls to a very pale red, as *cream of tartar* will do, being calcin'd it does not become *alkalous* like that of *Geronster*, and after calcination there remains only the eighth part which swells in little bladders like *Allom*, this convinces me that there is *allom* in the water of *Tonnelet*, and which is perhaps one of the causes of it's coldness.

This rubrick put into a crucible sparkles like the dust of charcole, continuing so more than half an hour, and the smoke of it smells like that of common sulphur, being likewise pounded with nitre it makes a considerable detonation, it diminishes a third part before it loses its sulphurous smell, and assumes a purple colour, but with these preparations it does not blacken the decoction of galls, and is immovable at the approach of the loadstone; to give it these two qualities it must be put into fusion till it acquires the natural colour of iron, then taking it out of the crucible you'll find it diminished half its weight, partly in mass and partly in coarse powder, resembling iron in weight and colour, being susceptible of the loadstone, and blackening the decoction of galls as the filings of iron would do, for which one cannot otherwise
account

account but by alledging that the great quantity of common sulphur which is found in this rubrick must be consumed by the fire before the iron can manifest it self; it has likewise the advantage of being shelter'd from the violence of the fire and having its parts united by the fusion of the sulphur, whereas the iron which is in that of *Geronster* having no sulphur, and being much rarified, cannot bear the force nor continuation of the fire without being intirely destroyed.

Five ounces of that of *Saurveniere* yielded me three scruples of a salt like that of *Tonnelet*, and made the same alterations on the decoction of galls; it diminished three fourths in calcination, and what remained was insipid and would not ferment with any acid.

I made twelve drachms of it red hot at a soft fire which sparkled very much for two or three minutes, and during the time I kept it upon the fire it diffused a smoak and smell of real sulphur, when that was over and the iron began to shew it self, I took it from the fire, diminished three drachms, which perswaded me that the fourth part of it was sulphur, after this the loadstone attracted it very easily, and it likewise blacken'd the decoction of galls, which it would not have done if it had been kept longer upon the fire, because the texture of its *Mars* not being very close, the fire would have easily consumed the metallick sulphur, and so destroyed this metal, but the fire continuing but a very short while, consumes only that kind of common sulphur which adheres to its exterior parts, whose unctuosity hinders the action of the loadstone, as oyl or grease hinders its attracting the filings of iron, and it is this kind of superficial sulphur, join'd with nitre, that makes a detonation. The rubrick of *Watros* affords the same

same sort of *Salt* as that of *Sauveniere*, which (like it) being calcined leaves no fix'd alkali, but only a little insipid earth, the rest going away in smoke. It smokes and sparkles in the crucible for a little while, but this smoke does not smell of real sulphur, but like that of turf mix'd with iron, which being gone off, and that of iron only remaining, I took it from the fire, diminish'd a fourth part of its weight, susceptible of the loadstone and tinging the galls, which qualities it loses like that of *Sauveniere* if you surpass the necessary degree of fire.

I also analysed that of the old *Geronster*, which is a fountain about forty paces above the new, which many people believe to be equal to it if not the best of the two, but they are much mistaken, for in what manner soever this *rubrick* is managed, it does not appear to be by much so *martial* as that of *Sauveniere*, or *Watros*, and incomparably less than that of *new Geronster*, which loses but two drachms out of twelve, to make it more susceptible of the loadstone than any of the others.

Five ounces of the red earth of *Pouxhon* afforded thirty grains of a piquant, fat and bitter salt, which being put upon a tile red hot, went almost all off in a disagreeable smoke and vapour, leaving behind a little black insipid earth that would not ferment with any acid, and altho' it was very fat, made no detonation with salt-petre; it whiten'd the decoction of galls, which a little after precipitated like a curd, leaving the liquor above of an orange colour; this *rubrick* being put into a crucible with salt-petre made no detonation, and being alone did not sparkle like that of the other fountains, but only exhal'd a kind of vapour that smell'd of iron, which is a strong presumption of its being intirely composed of it; but in what manner

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soever

soever it be prepared, it will not stir at the approach of the loadstone, and what is more surprising, in an instant it turns the decoction of galls very black, whereas that of the other fountains being prepared become susceptible of the loadstone (excepting that of *Geronster*) and don't blacken the decoction of galls till some hours after. I know you will say 'tis because the water of *Pouxbon* is impregnated with *vitriol*; but if this was the true reason, whence comes it that the salt I extracted from its rubrick had not any one vitriolous quality? is it possible for this vitriol to stick so close to the rubrick, that all the artifice, that workmen employ to separate common vitriol from the marcassity which originally contains it, could not disengage it? on the other hand, if you conceive it to be a vitriolous salt of iron that produces this effect, I must tell you that far from its being vitriolous, I find it to be a salt altogether like that which is produced of the red earth of *Geronster*, and that which is drawn from refined iron which do not tinge the decoction of galls black, but whiten it in the precipitation: to have the salt of iron such as I am speaking of, you need only to quench several bars of red hot iron in cold water, filter this water and evaporate it at a slow fire to a dryness. The cause then of this blackening quality cannot be imputed to any vitriol in the rubrick.

This is all I have to say upon these five or six kinds of red earth which in reality gives some ideas of the nature of the waters from which they are taken, but don't intirely convince from the vulgar prejudice of their being only consider'd as an excrement; I thought it therefore necessary to have proofs from the waters themselves, which I undertook, by evaporating, and distilling them, of which I shall give you a faithful account.

I evaporated by a slow fire an hundred pound weight of the water of *Geronster*, which being reduced to two pounds appear'd very thick and muddy, but letting it settle became very clear by the fall of a grey sediment which precipitated at the bottom, this water was red and smell'd strongly of lye ashes, and having filtered it through brown paper, and evaporated it to a dryness, I collected three drachms of a redish salt, very piquant, which fermented strongly with spirit of vitriol; the grey sediment, separated from a drachm and an half of glutinous earth, and dried at a slow fire, weighed half an ounce; it felt unctuous being press'd between the fingers, made a small detonation with salt-petre, and being thrown into the fire alone evaporated in a smoke that smell'd of sulphur mix'd with iron. I could not discover any rubrick in this sulphureous matter, nor in the glutinous earth, so threw them away as useless.

One hundred pound weight of the water of *Pouxbon* evaporated in the same manner, gave me an ounce of a sulphureous matter, five drachms of a glutinous earth, and half an ounce of salt of a lixivious smell and taste, fermenting but little with spirit of vitriol, muddying the decoction of galls, and tinging it of a purple colour, which insensibly precipitated to the bottom in the form of *curdled milk*, leaving the liquor above of a blackish colour; the salt of the water of *Geronster* does the same, with this difference only that the curdling which falls to the bottom is white without any thing of purple like that of *Pouxbon*. If it be a little calcined to make it the better ferment with acids, it immediately loses half of its weight, this does not happen to that of *Geronster*, which loses but a fourth part by the same degree of heat, from which

we may infer that preserving its acid in the evaporation better than that of *Geronster*, it is one of the reasons why the water of *Pouxhon* keeps better in bottles than that of *Geronster*.

This salt before it is calcin'd ferments tolerably well with spirit of vitriol, and if afterwards all its humidity be slowly evaporated it will be increased a sixth part; whereas that of *Geronster*, after it has fermented more strongly with the same spirit, is increased a third part; by this method you render back to these salts as much of the acid as they lost in the evaporation, which not only confirms what I have asserted, but one may thereby calculate the quantity of acids each pound of water contains in the pores of its alkalous salt. The sulphur being separated from its dross, and laid upon a red hot tile, almost evaporates in a smoke that smells of burnt iron, leaving only a little earth and alkalous salt.

It is surprising that this sulphur precipitates sooner than the rubrick which is much heavier, but it's probable that it being supported in the fluid by volatile acids which serve as so many *Floats* to keep it up, and being exhaled by the heat of the fire, leaves the metallick sulphur to its own weight, whilst the red earth which has no hold becomes as it were absorb'd in the empty spaces of the alkali.

This sulphur coagulates the decoction of galls without the least tincture of black, which confirms what I before advanced, that the iron is incorporated with the alkalous salt, and that it is only the sulphur that precipitates.

As to the alkalous fix'd salt and the rubrick, I must not forget to tell you that the red tincture which is drawn off, in boiling the red earth with three times it's weight of salt of tartar, to precipi-

tate

tate the sulphur with lime water, being again set upon the fire, there forms upon the surface a pale yellow skin, very thinning and of a sweetish taste, which being put upon a red hot tile evaporates away in smoak of a sulphureous smell, and it very much resembles the enamell'd cream that is every day to be seen upon the water in the fountain of *Pouxhon*, all the difference that I find is that this cream is sweeter, more diversified with colours, and much more sparkling, and being put into a crucible exhales a stronger smell of sulphur, otherwise they are much the same, for being dry'd they appear equally white, being calcin'd they afford the same quantity of fix'd salt, and being pounded with salt-petre they make an equal detonation. All which makes me judge that the said skin is a mixture of sulphur disengag'd of its earth and fix'd salt, which the fire forces up to the surface of the water, where they incorporate like fix'd salt and oyl boiled up together in the making of soap.

I likewise evaporated one hundred pound weight of the water of *Tonnelet*, which yielded me two drachms and a half of a salt as red as blood, which was so fat and oily that it was impossible to dry it. It made an explosion with salt-petre, with the same force and in the same manner as if it had been common sulphur, it fermented but little with acids, and after calcination not at all, which surpris'd me much, but having observ'd that it swell'd prodigiously in calcining and turn'd white, I concluded that there was *allom* in its composition; it did not blacken the decoction of galls neither before nor after calcination, as that of *Pouxhon* and *Geronster*, but made it muddy and of a pale yellow, without any precipitation. Besides the salt there was five scruples of a gross earthly sediment

which smoak'd much in the crucible, and made a detonation with salt-petre, and after being thoroughly calcin'd, blacken'd the decoction of galls.

Out of the same quantity of the water of *Sauveniere* I extracted only a drachm of salt of a lixivious smell and taste, it fermented pretty well with spirit of vitriol both before and after calcination, and was neither so fat nor red as the other, and easily dried. It made a little detonation with salt-petre, which was a proof of there being common sulphur in it, and it ting'd the decoction of galls to a light grey, without precipitating.

There was but one drachm of sediment, like in all respects to that of *Tonnelet*, except that it did not smoak so much upon the fire, and after being well wash'd turn'd the decoction of galls black, which is contrary to the other two fountains of *Pouxhon* and *Geronster*, whose sulphureous sediment being calcin'd, made the decoction of galls muddy, and of a whitish colour without the least degree of black, their salts having only this quality. Therefore we ought not to be surpris'd that the salt which has no *mars* should whiten the decoction of galls, and that the sediment that contains some particles of it, after being calcin'd and wash'd should turn it to a black colour, and on the contrary that the salt of *Pouxhon* and *Geronster* which contain *mars* should make the decoction of galls black, and that the sulphureous sediment which has none should make it white.

Having done with the *Evaporation*, I proceeded next to *distillation*, in order to endeavour to discover the nature of those spirits which are look'd upon, as the *soul* of the waters, and to which is attributed the force of their boiling by a simple warmth,
to

to intoxicate those who drink any large quantity of them, to burst the bottles that are cork'd immediately after being fill'd, and to fly with impetuosity out of a bottle that has been shook and the cork taken suddenly out. The more effectually to execute this design, I order'd to be made some cucurbites of glass, large and thick, about two feet high, and bent to a half circle from the middle to the top, which I seal'd *hermetically*, so that it had no communication with the air but by a pipe of the same substance fix'd within four inches of it's basis, and elevated three inches from the outside; it was through this pipe that I put some of the water of *Pouxhon* into one of these cucurbites which I fill'd two inches above it's insertion, that so the surface of the great column of water that took up a part of the gourd being elevated above the level of this insertion, the spirits that should arise would be forced towards the bending: likewise to prevent the little column of water in the pipe from losing its spirits, I took care to stop it with a good cork and bound it over with several folds of bladder. Matters being thus disposed, I set the cucurbite in warm water which I kept so till the mineral water within had acquir'd the same degree of heat as that without, when it begun to boil as if it had been upon the fire, but not long, for the glass burst with such violence that its pieces flew four paces distance. This *Phenomenon* convinced me of the existence and force of the *spirits*, and I was of opinion that to be able to extract them one should make use of a still that would resist their impetuosity, I therefore got one made of pewter, different from that of glass only by being a great deal larger, and instead of the bending for receiving the spirits I fix'd a large *chapiter* with a long pipe (which had not a vent at

the bottom) to serve for a *recipient*, the pipe I had placed four inches from the basis was the only passage through which any thing could be introduced into the still, and the chapter and gourd were so well foder'd that there was not the least vent.

I carried this still to *Spa* the 5th of *May* 1713, and the same day made a trial of it with *Dr. Cocquelet* (an old practitioner at *Spa*) at the well of *Geronster*, which has the repute of exhaling more spirits than any of the others. We dipt the still in the well and made it take in the water through the pipe within a finger's breath of the surface that it might receive a greater quantity of it's spirits, which in the distillation would be forced up to the chapter. The pipe we stop'd close and cover'd with 5 or 6 bladders, and as its mouth was contrived with a ringlet round it, the ligature we made was the better secured. This being done we began to heat our still with warm water and augmented it by degrees till we made it boil.

During the distillation, which lasted four hours, there appear'd a *Phenomenon* which very much employ'd our curiosity, and at last became very surprising, for between the cork and the folds of bladder there was lodg'd a quantity of *spirits* that stretched the bladders to that degree that we expected every moment they would have burst, and continued so notwithstanding our cooling the machine even to the dipping it in the well. *Dr. Cocquelet* was for piercing the bladders, but I persuaded him to forbear till we had taken out what was risen up to the pipe of the chapter, which we did by boring a hole in its bottom. There came out about two ounces of *liquor* which we received in a viol, immediately after which the spirits that
were

were lodg'd between the cork and the bladders, not only repass'd through the cork but likewise through the pillar of water contained in the pipe, and so up to the top of the chapter, and lastly came whizzing out of the little hole we had bored at the bottom of its pipe, it had neither taste nor smell, and I had reason to believe that it was air inclosed in those corpuscles that are seen to float in the water, which being set in motion by the heat broke it's prisons, for we see that those corpuscles appear torn, and that they come from the surface of the water where the air had carried them before it could disengage it self from them. The spirit or distilled liquor we collected in the viol was of a disagreeable bitter, and smell'd very strong of sulphur, and it seem'd to me that it was the sulphur of the whole 24 pounds of water contain'd in the still, because the water which we took out of the gourd after the distillation was altogether insipid, being deprived of whatever substances it was before impregnated with. The next day we distilled in the same manner the water of *Pouxbon*, which yielded a liquor only a little tartish, but it had undoubtedly lost its strength in fretting the pewter of the roof of the chapter, for some weeks after as I was rectifying some spirit of wine in the same cucurbite, it brought away with it through the pipe of the chapter, a white salt, and sweet like salt of saturn, which could no otherwise be formed but by the volatile acid of the mineral water, as salt of saturn is formed by the acid of distill'd vinegar incorporating it self with the lead. The air whizz'd out of the pipe of the chapter in the distillation of the water of *Pouxbon* in like manner as it did in that of *Geronster*, but without the smell of sulphur.

In short being convinc'd by these experiments that it was air and not combustible spirits that acted with such violence in the waters, I thought it needless to proceed to the distillation of those of *Tonnelet* and *Sauveniere*, and that it was better to employ my time in discovering how this air, the acid spirit, the mars, the sulphur, and the salt which I found, enter'd into their composition.

There are several ways which minerals and metals may mix with water in the bosom of the earth, but I know only two that relate to the waters of *Spa*; the one is that whilst the mine being soft is washed with a running water, that loads it self with what it finds the most dissoluble; the other presupposes the water already loaded with an acid, and meeting with a mine hard and solid drags away as much of it, as it has time to dissolve, it is in this last manner that most who reason on the waters of *Spa* believe them to be impregnated with vitriol of mars, and they pretend to prove it by the taste which comes near that of simple water in which vitriol of mars has been dissolved, by the blackness it takes from gauls, and by the effects it produces in humane bodies. I was along time prepossessed with this notion, but not having been able by any experiment to discover this pretended vitriol, I was oblig'd to take another course; you will perhaps alledge that the acid which dissolved the mine of iron to compose this vitriol of mars is so subtil, that it flies away in the evaporation that I make to extract it, and that quitting thus the metallick matter this vitriol of mars is destroyed; if that was the case the alcalous salt which I extract having its pores much larger, is less liable to be preserv'd, which is contrary to the experiments I have made, and particularly

ticularly to that upon the rubricks of *Sauveniere*, *Tonnelet* and *Pouxhon*, that yields only an acid fix'd salt in a little earth and sulphur. The other opinion that supposes the mine soft and dissoluble agrees better with my experiments, and may serve for a basis to explain all those *Phenomena's* I have mention'd, but first I think it behoves me to declare my opinion, how I think this mine of iron is vegetated in the bosom of the earth.

According to the analysis that I have several times made of this metal, it is a composition of *earth resembling clay*, of *Sulphur* tolerably fix'd, and of a *double salt*, that is to say, half *acid*, and half *alcalous*; as this composition could not be made without these several principles united with, and penetrating each other in different manners, and besides, they are all fix'd except the *acid* in which the salt is imbibed, I therefore believe it is it that ought to be look'd upon as the great mobile of the whole work.

Taking it then for granted that this earth mix'd with sulphur, and alcalous fix'd salt exists in the bosom of the earth, the acid of the air, subtil and always in motion, centering in the salt, must excite a fermentation, which tho' it can be neither quick nor strong, being obstructed by a great quantity of earth, yet sufficient to swell and dilate the mass, till the whole being interwoven and united together, the fermentation ceases, when this mass thus swell'd and dilated begins to come to it self by expelling the air that was lodged in the cavities of its rarefaction, and this insensibly till its whole integrant particles be so condens'd and reunited together that they may become the proper substance or marcaffity of iron. But if any water happens to run through this mass before it becomes thus condens'd and harden'd

den'd, it is evident that by diluting and dissolving it, the water becomes loaded with the different substances of which it is composed, *viz.* of *mars* already formed, of *sulphur* and *salt*, which the acid spirit of air had begun to put in motion, and much more so as this subterraneous vegetation forming itself successively, it is impossible that that part of this mass, upon which the spirit of air had made its first impressions, would not be intirely elaborated before the other could be scarcely begun. You will undoubtedly object that if this was fact, the water would not stay till a part of this mass was form'd into a metal, but that it would immediately wash it as soon as the spirit of air had a little rarified it, and so would only carry along with it the salt, earth, and sulphur, and not the formed mars. To which I shall answer, that the mass does not become penetrable till after the air which was inclosed, in freeing itself from its prisons, makes several holes or crevices in the mass, through which the water insinuates itself into the cavities which it left, where it loads itself with those different substances, nevertheless part of the air remains entangled with some mars already formed, not having been able to disengage itself otherwise than by carrying away with it the metallick particles in which it is folded up, as in so many vesicles that resemble those that are made in a lather of soap and water. The air thus inclosed yields itself to the current of the water which dissolves the marcassity, and by its lightness holds the metal imperceptibly suspended, and whose substance being so much dilated becomes transparent, but as soon as the air has made its escape the parts of these vesicles become so contracted that the transparence ceases, and being left to their proper weight they are seen to precipitate

porate themselves from the surface of the water where the air had carried them before it could disengage itself.

It is undoubtedly this air that in bursting those vesicles causes such a rumbling noise and bubbling of the water when 'tis newly drawn and exposed to a simple warmth, and which is followed with almost the total loss of the vitriolick and poysonant taste it had at the spring. This has given occasion to those who have examin'd these waters to say, that they contain a volatile vitriol of mars, and spirits so subtile and penetrating, that the least degree of heat dissipates them, and without its being possible to stay them, nevertheless all this depends only upon the destruction of the martial vesicles, thick set with the points of our airy acid which in this shape counterfeits the taste of vitriol of mars, but ceases as soon as the explosion of the air tearing those vesicles, and shaking them roughly, lets lose the acid points fix'd in this thin substance, that afterwards float confusedly in the water, whilst the mars with which they were combined falls by its proper weight to the bottom of the vase, where it appears like a kind of excrement. It is then evident, that to drink the waters in their full strength and goodness, it is absolutely necessary to come to the springs, because their vertues depend as much upon this admirable disposition of which I have explain'd the mechanism, as of the quantity and quality of their different elements. This is sufficiently proved by the example of *gun-powder*, which owes all its force, not to the quantity of *sulphur* and *salt-petre* of which it is composed, which separately are without action, but intirely to the proportion of each, united one with the other.

You

You will further object that this acid spirit of air to which I attribute so many vertues is but imaginary, and that before it be allowed to act so generally, and efficaciously, I make it plainly appear. That is easy for me, having only to instance the example of polish'd iron that rusts in the air, that of old lime, which being exposed a long time in the air, impregnates a volatile acid, and becomes salt-petre ; in a word, that of the ashes of wood and burnt earth, which containing only an alcalous fix'd salt, cannot serve to vegetation, nor form this double salt in the plants they produce without the help of this ætherial acid. It is by this artifice that the inhabitants of *Spa* (without knowing the reason) lay snares for this father of vegetation, and oblige him to rest upon the surface of the earth, without which it would produce little or nothing for their nutriment, I shall nevertheless observe, that notwithstanding all their labour, they can only get it to yield rye and oats, and some spelt ; and if they eat bread made of wheat, they must have it from elsewhere.

There is another thing curious enough in relation to this soil, which is, that earth which is burnt produces only two years, whereas that which is remanured with lime continues 25 or 30, bearing indifferently all sorts of grain, which depends, in my opinion, upon the pores of the lime, which being of a substance more solid than the fixed salt of the ashes of wood or turf, are not so easily destroyed, so are consequently in a condition to serve a longer time for this kind of magnetism.

After this digression, I return to the waters, to endeavour by the same principles to discover the nature of each of them in particular, and wherein they differ one from another.

It is certain, that there is not any essential difference in all those springs; for they have all their origin from *Mars*, or the substance of which it is form'd, except that of *Tonnelet*, that has a little of the allom, *which it receives in passing thro' some alluminous earth*. This difference is purely accidental, they all depending less or more upon the same elements, or their different elaboration.

The mother earth of *Geronster* abounds very much with the alcalous salt, which is stronger than in any of the others, the fermentation which results from its conjunction with the airy acid is so violent, that part of its sulphur becomes volatilised; at the same time that what remains hook'd in among the fermenting salts, is woven and elaborated into real *Mars*, leaving besides some metallick sulphur, and a great quantity of double salt, which could not be elaborated with the earth to become perfect *Mars*, before the water came and carried it off. Thus a bottle of this water comes as a medicinal potion ready prepar'd from the bosom of the earth, being compos'd of a great quantity of this *airy acid* lightly stuck to our *salts*, sulphurs, and to the metallick matter, of four grains of *Mars* divided into a million of parts, of six grains of *double salt*, of seven grains and a half of *metallick sulphur*, and of a scruple of a *sulphureous spirit*, which providence seems to have added as a corrective to the actual coldness of the water, without mentioning the wonderful effects it produces upon the causes of different maladies.

In the *Pouxhon* the earth and the sulphur predominating over the alcalous fix'd salt although abounding, the fermentation is not strong enough to sublimate the spirits, nor thoroughly elaborate to a metal the sulphur that is in its way, which renders

renders its *Mars* imperfect, and is the cause that there is not any spiritualised sulphur, as in the *Geronster*, but it has as much more of the metallick sulphur preserved in its water by a good quantity of our vegetable salt; this it is that makes this water so much better; though even it should be deprived of its *Mars* by the dissipation of that little air it hides in its vesicles; it would nevertheless keep a long time, without its strength and goodness suffering any considerable diminution, therefore one may conclude, that being so rich in minerals, and less charg'd with aerial matter, it is the fittest of all the others to be transported into foreign countries; but that *Geronster* having its chief strength from perfect *Mars* and spiritualised sulphur which separate themselves so easily from the water, it should be drank at the spring.

All what I have observed of the different modification or elaboration that the sulphur of the waters of *Geronster* and *Pouxbon* acquire by fermentation, proves itself clearly, because we observe in those of *Tonnelet* and *Sauveniere*, that their wanting the alcalous fix'd salt, as we remarked in the analysis of their rubrick, or else not having over and above what is necessary to form a little of the martial matter, the fermentation with the airy acid must cease after this little work, leaving the sulphur without elaboration, and almost like to common sulphur, particularly in the waters of *Tonnelet*, in whose mother earth it is in greater quantity, it ought to suffer a less alteration. Those two wells are therefore more cooling than the others, not only because their sulphur is neither metallick nor volatilised, but likewise that a great deal of the airy acid not having found any alcalous salt to incorporate with,

mix'd

mix'd itself with a little earth and sulphur, as we observed before; so that it is not without reason that they are prescrib'd to cool the Blood, and dissolve the gravel and stone in the urinal passages, preferring, however, *Sauveniere* to *Tonnelet*, both because of the crudity of its sulphur, and for its containing allom, whose astringent I always thought pernicious when it was necessary to dilate those passages to give vent to the gross and sandy humours.

C H A P. III.

A brief account of the qualities and virtues of the waters of SPA.

EVERY body that considers the several minerals that are contained in the waters of *Spa*, will easily grant that they are of a warming and drying Nature, tho' at the same time they are actually cold and moist, and daily experience shews us that they often produce contrary effects, particularly in women afflicted with divers distempers proceeding either from the suppression or too great flux of the *Menses*, in both which cases, the dismal consequences of which are well known, these waters are a most powerful remedy, yielding to no other whatsoever, of which many examples might be given.

They are also very effectual in curing the *green sickness*, the *whites* and disorders of the *matrix*, in which they not only give relief by drinking them, but also by injection, fomentation and bathing: they also cure *barrenness* proceeding either from the too great humidity of the *matrix*, or relax-

tion of the parts, and also prevent miscarriages, of all which we have many instances.

They give also great relief in *catarrhas*, either by drying up or evacuatting the phlegmatick and ferous humours, and many persons afflicted with *migrains*, *giddiness* and inveterated *head-acks* have been much eased thereby. They are very effectual in curing ulcers of the *Penis* when they are used by injection, and in *simple Gonorrhœas* either by drinking, siringing or fomentation, and in *venereal Gonorrhœas*, when the poison is removed, but the ulcers cannot be dried up, and when the parts for generation have been weaken'd thereby, they restore and fortify them again.

They also remove excessive heat of the *urine*, and quiet the pains of the *kidneys* and *bladder*, if they be not occasioned by some obstinate obstruction, but if this be the case, they may increase the pains by pressing the matter that causes the obstruction, without expelling it altogether, which chiefly happens in the gravel.

They relieve very much such as are for the most part *costive*, and on the contrary they stop great *looseness* by diluting and temperating the too sharp bile. They also free the body of gross, viscus, phlegmatick, cholerick and melancholy humours, mostly by urine and stool, often by vomiting, and sometimes, but rarely, by sweating.

They renew the *hemerroidal flux*, when stopped, and restrain it when immoderate, and by promoting the circulation of the blood, correcting and evacuating humours, sometimes restore blind people to their sight.

They destroy all sorts of *worms* and *insects* in the body, and this is so well known, that there is no occasion to descend to particulars, only shall mention

mention a person afflicted with a violent pissing of blood, with great pains in the kidneys, not always alike, but with frequent intervals, who by drinking the waters was happily deliver'd, they bringing away upon the 7th day a great Insect which gnawed the left kidney, and thereby opened the vessels, and occasioned the pissing so much blood, and so violent pains.

They cure redness of *eyes*, as also the *itch*, and other cutaneous distempers by using them either internally or externally.

They remove obstructions in the *liver*, *spleen* and *miserable veins*, and all inflammations occasioned thereby.

Many *hydropical persons* are relieved thereby in a very surprising manner, discharging the waters both by urine and stool, and the lymphatick vessels being too much dilated or broken, are again consolidated and contracted by the astringent particles in the water.

They are so comfortable to the *stomach*, that by their agreeable astringency they restore it to its right tone, when too much relaxed, and such persons as are incommoded with *vomiting*, *belching*, *hiccupps*, and *throwing up their victuals*, do soon find relief after they begin drinking. They are more effectual than any other remedy for carrying off sand, and freeing from all nephritick pains, and often carry off small stones; but such as suspect that they have great stones in their kidneys, ought to use them with great caution, and if they are resolved to drink them, they ought not to use any exercise, as in other cases, but drink them a bed, lest the stones be loosened and carried into the *ureters*, as has sometime happened; they are also very effectual for curing ulcers in the kidneys

and bladder, incontinency of urine and diabetes, if used with due precaution.

In *scorbutick* cases they are found to be an excellent specifick. The inhabitants of *Spa* are free from head-aches, catarrhs, heart-aches, stone, and obstruction of the spleen and liver, and it is rare to see any of them incommoded with jaundice, gout, scab or epilepsy. By all which it appears that these waters have a singular virtue not only for the preservation of health, but also exceed most shop-remedies for the cure of diseases, and that with expedition and safety, and great gentleness, and may be used by all persons, old and young, in most constitutions, and all seasons of the year.

Notwithstanding of what has been said of their singular virtue and efficacy, yet no person ought to presume to order them in all kind of distempers as an universal remedy; for in the opinion of very wise physicians they are not good either in *Epidemical* or *Endemial* distempers, as the *Plague*, *Poison*, *Pox*, *Cancer*, *Apoplexies*, *Epilepsy*, true *Palsies*, *Asthma's*, &c. in which, tho' sometimes they may accidentally give relief, yet they are by no means a specifick for them.

It would be proper now to give an account of the method and rules that are judged necessary to be observed in the use of the waters; but as in the preceding Treatise on the waters of *Pyrmont* the learned author has given a very full account of that method which after many years experience he has found to be the best and most successful, and has laid down such rules as are very proper to be observed in the use of all mineral waters, and as they are very applicable to the *Spa* waters,
and

and coincide for the most part with what the most experienced physicians have said upon that head, I did not think it proper to trouble the reader with useless repetitions, but judge it sufficient to refer the patient to the preceding Treatise, where he will find many things highly reasonable, and worthy to be taken particular notice of, as contributing very much to his successful use of the waters.

F I N I S.



E R R A T A:

Page 15. Line 9. for *superficies* read *surface*. p. 16. l. 27, 28, 29, to the end of the page, for *grain* r. *grains*. p. 22. l. 13. for *Hare* r. *Slare*. p. 25. l. 16. dele *presently*. p. 30. l. 15. r. *pulverised*. p. 43. l. 35. r. *acid of vitriol*. p. 46. l. 5. for *vitriol* r. *vitriolick*, and in several other places, l. 8. r. *overcome*, l. 9. r. *form*. p. 50. l. 26. for *tepmeating* r. *temperating*. p. 51. l. 7. r. *Cachexies*. p. 67. l. 9. r. *assistance*. p. 85. l. 31. for *come* r. *comes*. p. 91. l. 32. for *healths* r. *health*. p. 3. l. 3. r. *primæ*.

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